The Metals REVIEW

OWNED AND PUBLISHED BY THE MEMBERS OF THE AMERICAN SOCIETY FOR METALS

THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

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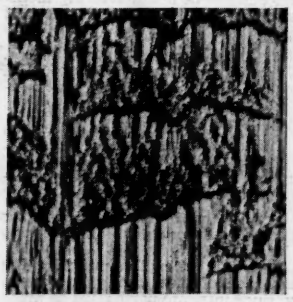

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Seasholtz to Give Lecture Course on "Heat Treatment" in San Francisco

A series of five lectures on "Principles of Heat Treating" by A. P. Seasholtz, metallurgical engineer, E. F. Houghton & Co., will constitute the 1944 fall educational lecture course of the Golden Gate Chapter A.S.M. early in November.

Mr. Seasholtz will open the course on Wednesday evening, Nov. 8 with a discussion of general principles of heat treating. Hardenability will be the subject on the following evening, application of salt baths in austempering and martempering and application of cycle annealing on Nov. 10, salt baths for carburizing and heat treating high speed steels on Nov. 13, and special applications and trouble shooting, followed by an open discussion, on Nov. 14.

All men in the metal industry interested in heat treating are invited to attend this free lecture course, which will be held in the P. G. & E. Auditorium, 245 Market St., San Francisco, at 7:45 each evening.

PASS-A-ROUND

Many executives in your plant will want to see this record of what happened last month in the metal industry. Just fill in the names, note items for special attention—and Pass-A-Round.

Name	Item No.	Check

File or Clip for Future Reference

This is a record of important new developments in the metal industry during the past month—Save it!

Compliments

To ARTHUR PHILLIPS, professor of metallurgy, Yale University, on the award of the honorary degree of doctor honoris causa by the University of Sao Paulo, Brazil, where he recently completed a lecture series. Professor Phillips was also honored by the Associaco Brasileira de Metais, which presented him with a gold medal and made him a director of the Society.

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To HORACE H. LESTER, physicist, and WALLACE B. KENNEDY, superintendent of production, Watertown Arsenal, on the presentation of Exceptional Civilian Service Awards "for extraordinary service within and beyond the call of duty."

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To A.S.M. Past President A. H. D'ARCAMBAL, vice-president, consulting metallurgist and general sales manager of the small tool and gage department of Pratt & Whitney Division, Niles-Bement-Pond Co., on the celebration of his 25th anniversary with the company.

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To E. V. DUNBAR, southeastern representative, Wolverine Tube Division, Calumet and Hecla Consolidated Copper Co., Atlanta, Ga., on a citation by the U. S. Army for work he has done "at a sacrifice in time, money and travel" to render engineering assistance to contractors and to the Birmingham Ordnance District, which resulted in notable achievements."

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To FRED A. MAINZER, general manager of the Pacific Brass Foundry of San Francisco, on his appointment to the National Brass and Brass Foundry Industry Advisory Committee of the O.P.A.

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To WILLIAM BLUM, chief of the section of electrochemistry of the National Bureau of Standards, on the award of the Eighth Edward Goodrich Acheson Medal and $1000 prize by the Electrochemical Society.

What's NEW..... in THE METALS REVIEW

Review of Current Metal Literature

Addresses of Publications	12
Analysis	5
Cleaning and Finishing	16
Corrosion	3
Design	18
Electroplating	5
Foundry Practice	8
Furnaces and Fuels	10
Heat Treatment	10
Industrial Uses and Applications	18
Laboratory Apparatus, Instruments	5
Machining and Machine Tools	14
Materials Index	2
Miscellaneous	18
New Books	19
Powder Metallurgy	3
Production of Metals	2
Properties of Alloys	2
Properties of Metals	2
Protection	5
Refractories and Furnace Materials	10
Secondary Metals	10
Statistics	19
Structure	3
Temperature Measurement and Control	8
Testing and Inspection	5
Welding	16
Working, (Rolling, Forging, etc.)	11

Other Departments

Review of Products, Equipment, Materials	13, 15
Review of Manufacturers' Catalogs	20
Meeting Calendars	7
Employment Bureau	6
Reader Service Coupon	13
Advertising Index	20

Review of Current Metal Literature to Be Bound With Index

Work has already been started on an exhaustive subject and author index for the A.S.M. Review of Current Metal Literature, according to announcement by the national headquarters of the American Society for Metals. This index will be included in the bound volume of the A.S.M. Review of Current Metal Literature, which will be available early in 1945.

This volume will reprint all of the installments which have appeared in THE METALS REVIEW since February 1944, and will continue through January 1945, thus providing a complete, annotated reference work and bibliography of all articles and books dealing with metals which have appeared during the year 1944.

In addition to the "Materials Index" which is included with each monthly installment, the bound volume will also be thoroughly indexed by subject and author. Prepublication forms for A.S.M. members to use in ordering the book at a special reduced price will be printed in the November and December issues of THE METALS REVIEW.

The October installment of the A.S.M. Review of Current Metal Literature, starting on page 2 of this issue, includes annotated references to the papers presented by the American Society for Metals, the American Welding Society, and some of those presented by the American Institute of Mining and Metallurgical Engineers during the National Metal Congress being held in Cleveland Oct. 16 to 20, in addition to all of the engineering, scientific and industrial journals which have appeared here or abroad during September. A list of these publications and their addresses is given on page 12.

The work of surveying and annotating the literature and preparing the monthly installments of the A.S.M. Review of Current Metal Literature, as well as the work of indexing the bound volume, is being done in the library of Battelle Memorial Institute, Columbus, Ohio.

Slow Cooling Not Always Necessary for Good Annealing

Reported by Ralph W. Stahl
Lindberg Engineering Co.

Annealing techniques resulting in greatly improved quality of finished products were described by Peter Payson, assistant director of research, Crucible Steel Co. of America, at the meeting of the Indianapolis Chapter A.S.M. on Sept. 18.

Throughout the years slow cooling has been assumed to be an important part of the annealing operation. However, this assumption is often erroneous for there are many cases in which steel can be annealed to a satisfactory hardness and microstructure with a minimum amount of slow cooling, resulting in a much shorter annealing operation.

The annealing of steel is not dependent on cooling rates alone, but on two metallurgical reactions, namely, the formation of austenite and the subsequent transformation of the austenite at high temperatures. The exact annealing procedure varies depending on the composition of the steel involved, but with the aid of the triple T curve for a particular steel the proper cooling rate for annealing by continuous cooling, and the temperature at which the steel can be removed from the furnace and permitted to cool rapidly, can be established.

By this method it is possible to forecast the exact type of anneal obtained, thus securing consistently higher quality results. Furthermore, in a large number of cases, a proper understanding of the metallurgical factors may result in appreciable savings in the cost of the operation.

A.S.M. REVIEW OF CURRENT METAL LITERATURE

An Annotated Survey of Engineering, Scientific and Industrial Journals and Books Here and Abroad, Received in the Library of Battelle Memorial Institute, Columbus, Ohio, During the Past Month

1. PRODUCTION OF METALS

1-111. The Constitution of Some Basic Open-Hearth Slags. Brian Mason. *Engineering*, v. 157, June 30, '44, pp. 515-516.

Petrographic examination of solid slags showing the phases present.

1-112. The Production of Steel Direct From Ore by the Hearth Furnace Method. Albert E. Greene. *Mining World*, v. 6, August '44, pp. 31-32, 34.

Discussion of the operation and method. Advantages are: Hearth furnace can use almost any variety of coal in fine form, does not require coke, uses a small amount of electric energy and produces steel direct.

1-113. Magnesium Metal From Carlsbad Potash. *Engineering & Mining Journal*, v. 145, August '44, pp. 70-75.

Recovering the entire ultimate values in products from ore. The production of muriate of potash, sulphate of potash, magnesium metal, and hydrochloric acid from Carlsbad ores, leaving only the common salt and dirt from the ore as unused products. Flow sheet and description of process.

1-114. Postwar Importance of Beneficiated Iron-Bearing Materials. Charles E. Agnew. *Steel*, v. 115, Sept. 4, '44, pp. 98-100.

Washing and screening of iron ores as well as fine grinding to obtain high-iron concentration followed by sintering are being studied closely by blast furnace operators. Wider use of beneficiated materials in the immediate future may force a change in blast furnace operation. Factors governing furnace productive capacity with a soft ore burden and a full sinter burden are compared.

1-115. The Fontana Steel Plant and Its Raw Materials Supply. George D. Ramsay. *Mining & Metallurgy*, v. 25, Sept. '44, pp. 423-426.

Kaiser Company's completely integrated works near Los Angeles uses ore shipped 175 miles and coal from Utah.

1-116. Comparison Between the Different Methods of Regulation of Electrically Driven Turbo-Blowers for Steelworks. *Brown Boveri Review*, v. 30, Nov.-Dec. '43, pp. 328-336.

Defines the regulation requirements of steelworks blowers and indicates the means available for fulfilling these in the case of electrically driven blowers.

1-117. Applications of the Velox Principle in Mining and Metallurgical Plants. *Brown Boveri Review*, v. 30, Nov.-Dec. '43, pp. 356-368.

Special design and method of operation of heat exchangers. Object of the Velox principle is the raising of the output and of the efficiency, as well as the increasing of the readiness for service, at the same time reducing considerably the dimensions of the plant and the amount of material required.

1-118. Basic Electric Melting Procedure for High Quality Alloy Steels. A. L. Ascik. American Society for Metals. 1944 Preprint No. 26, 25 pp.

Melting problems of high quality alloy steels. Describes the charge, melting and boiling periods, gives a definition of the white and carbide slags, their chemical and physical advantages and disadvantages, and describes the addition of aluminum as harmful to the cleanliness of steel and a high silicon content as very helpful to the surface condition of the ingots. 5 ref.

1-119. Basic Openhearth as a Producer of Alloy and Special Steels. C. D. King. *Metal Progress*, v. 46, Sept. '44, pp. 478-480.

Grades of special steels which are now being successfully made in basic openhearth furnaces; prerequisite for the successful production of these high grade steels is that the heats be worked, refined and tapped hot; improvements in refractories have kept step with changes in furnace design and also have contributed to the successful production of alloy steels.

1-120. Electric Furnace Quality versus Openhearth. Gilbert Soler. *Metal Progress*, v. 46, Sept. '44, pp. 480-483.

Electric furnace provides certain advantages over the openhearth furnace, which, if utilized, result in a higher quality product; closer chemical analysis limits can be maintained, and greater uniformity of chemistry obtained between various ingots of the heat; grain size, abnormality, and hardenability are more uniform and subject to closer control; cleaner steel can be produced containing less deoxidation products; lower sulphur and phosphorus contents can be obtained; standard practices can be established and more easily followed, insuring uniform quality from heat to heat.

1-121. Recovery of Zinc. A. G. Arend. *Chemical Age*, v. 51, August 5, '44, pp. 131-133.

Procedures with spent copper extraction liquors.

1-122. Modern Copper Smelting. W. H. Dennis. *Metal Treatment*, v. 11, Summer '44, pp. 103-111.

Smelting of copper by modern processes shows how the early pioneer work of South Wales, which once held the first place as a copper-producing center, has influenced developments abroad.

1-123. Postwar Importance of Beneficiated Iron-Bearing Materials. Charles E. Agnew. *Steel*, v. 115, Sept. 11, '44, pp. 112, 174, 176-177.

Procedures followed in blast furnace practice when stack is burdened with full sinter rather than when soft ore charges are employed. Furnacemen in near future may be compelled to use greater quantities of beneficiated materials in the burden. Ores subjected to beneficiation afford larger production with lower fuel rate and less by-products. 3 ref.

1-124. The Use of Graphite in the Open Hearth Charge. John O. Griggs. *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1065-1067.

Elimination of sulphur; scrap after the war; graphite practice and steel quality.

Materials Index

To the Metal Literature Survey

THE FOLLOWING tabulation classifies the articles annotated in the preceding pages according to the metal or alloy concerned. The articles are designated by section and number. The section number appears in bold face type and the number of the article in light face.

General Ferrous

1-111-112-114-116-119-120-123-124; **2**-35; **3**-146; 4-33; **5**-41; **10**-52; **15**-25; **16**-115-117-120-122-125; **17**-48-56-57-60; **18**-191; **21**-121; **22**-448; **26**-87-88-89-95-96.

Cast Iron

3-165; **6**-46; **12**-222-240; **14**-295-298-301-310-311-316-317-324-329-332-333; **15**-25; **16**-116; **17**-51; **22**-410-421-427-450; **24**-46.

Cast Steel

3-164; **12**-239; **14**-291-300-303-313-315-320-322-331-333; **18**-193-196; **22**-447.

Wrought Carbon Steel

3-151-161-166-168-173; 4-34; **6**-41; **1**-83; **8**-69; **12**-232-247; **16**-123; **18**-179-190; **19**-236-241-242-245-252; **20**-362; **21**-113; **22**-386-397-401-403-404-422-428-446; **23**-259; **24**-46; **26**-92; **27**-134.

Alloy Steel

1-118-119-120; **3**-155-156-157-163-164-168-170-175; **12**-233; **18**-185-186-187-199; **22**-408-432-438-443; **26**-92.

Stainless and Heat Resisting Steel

3-163; **6**-42-43; **18**-199; **21**-117; **22**-401-414-435-447.

Tool Steels and Carbides

3-162; **14**-330; **18**-188-198-200; **19**-261-263-264; **20**-333-336-345-359-360; **22**-416.

General Non-Ferrous

3-149; 4-35; **5**-41; 8-71-73-74; **10**-50-51; **14**-321; **23**-248; **25**-211.

Aluminum and Aluminum Alloys

3-148-149-158-159-167; **5**-37; **6**-40; **10**-50; **12**-236-243-250; **14**-294-302-314-319-327-328; **18**-181; **19**-238-249-265-266; **21**-107-108-111-119; **22**-388-396-405-407-412-415-424-434-439-445; **23**-256-259-264-272; **24**-47.

Magnesium and Magnesium Alloys

1-113; **3**-149-160-174; **6**-44-45; **12**-217-236-243-249-250; **14**-308-334; **18**-181; **19**-238-248; **20**-351; **22**-389-405-407-431; **23**-259; **26**-83.

Copper, Brass and Bronze

1-122; **3**-149-150-152-153-154-172; 4-33; **5**-40; 8-70-75; **10**-48; **14**-292-308-309-314; **19**-243; **22**-390-411; **26**-85-94.

Nickel, Monel and Nickel Alloys

3-154; 4-33; **10**-50.

Lead and Lead Alloys

23-263; **26**-93.

Tin and Tin Alloys

3-172; **18**-195.

Zinc and Zinc Alloys

1-121; **8**-75; **13**-34; **27**-126.

Miscellaneous and Minor Metals

2-34-37; **3**-152-153; **18**-195; **26**-94.

2. PROPERTIES OF METALS

2-33. Practical Aspects of Diffusion in Metals. *Metallurgia*, v. 30, June '44, pp. 73-76.

The degassing of metals; diffusion and microstructure; gas-metal diffusion in fabricating processes; diffusion in alclad steel; diffusion of indium in bearings and in chromizing.

2-34. Columbium. *Chemical Age*, v. 51, July 1, '44, p. 17.

Pure metal derived from the oxide.

2-35. Solubility of Ferrous Oxide in Pure Solid Iron. *La Technique Moderne*, v. 35, no. 13 and 14, July 1 and 15, '43, p. 110. *Engineers' Digest*, v. 1, August '44, pp. 494-495.

Evidence of the coalescing of FeO inclusions, which is a direct consequence of this solubility.

2-36. Capillarity of Metallic Surfaces. E. R. Parker and R. Smoluchowski. American Society for Metals. 1944 Preprint No. 13, 11 pp.

Phenomena observed in brazing and coating operations roughly correlated on the basis of a simple consideration of surface energies and geometrical factors. It is shown that the balance of changes of the solid-liquid, solid-air and liquid-air surface energies depends upon the capillary roughness of the metallic surface. The roughness is approximated by a groove of an angle α inclined to the surface of the metal at an angle β.

2-37. The Rare Earths. R. C. Vickery. *Metallurgia*, v. 30, July '44, pp. 130-134.

Present position of the chemistry of the rare earth elements. Their nature summarized and a general account given of methods of separation, identification and determination.

3. PROPERTIES OF ALLOYS

3-145. Bimetal Performance at 800 F. P. R. Lee. *Metals & Alloys*, v. 20, August '44, pp. 346-349.

A test method and results for bimetal at 800° F. Effect on service performance of manufacturing methods, prior heat treatment and internal and external stresses.

3-146. Factors Affecting Ingot Product Surface. H. F. Lesso. *Iron & Steel Engineer*, v. 21, August '44, pp. 63-73.

Evaluations of some of the many factors which influence the surface of semi-finished steel.

3-147. Wood or Metal? *Aero Research Tech. Notes*, no. 19, July '44, pp. 1-6. *Engineers' Digest*, v. 1, August '44, pp. 517-519.

Tension; compression; the structure loading coefficient; advantages of composite structures.

3-148. High Strength Alloy with Natural Re-Aging Properties. Hiram Brown. *Aeronautical Engineering Review*, v. 3, August '44, pp. 65, 67, 69.

Commercial use of a high strength, natural aging aluminum alloy should be of outstanding interest to the aircraft industry, since intricate parts must be made free from warpage, distortion, or cracks. Advantages: (1) Severe stresses, caused by quenching, which are likely to cause cracking avoided. (2) Warpage due to high temperature and subsequent straightening operations avoided. (3) Expensive heat treating equipment to handle large castings unnecessary. (4) Production delays due to fitting heat treatment to foundry production are not encountered. 7 ref.

3-149. Modern Views on Alloys and Their Possible Application. W. Hume-Rothery. Institute of Metals *Journal*, v. 70, June '44, pp. 229-273.

Cohesion rises to a maximum in the region of groups VI and VII. General effect of size factor and electron concentration on the formation of solid solutions is described. It is shown that two kinds of lattice distortion have to be considered, one due to the valency electrons, and the other to the electron clouds of the ions. The effect of this on the solubilities of some elements in solid copper is indicated. Characteristics of the theory of magnesium alloys and aluminum alloys also discussed.

3-150. Beryllium Copper in Instrument Design. L. B. Hunt. *Journal of Scientific Instruments*, v. 21, June '44, pp. 97-105.

Physical characteristics of beryllium copper with particular reference to elastic properties. Usefulness of this alloy for instrument springs and similar parts is shown to be in its combination of high elastic limit with relatively low elastic modulus. Technique required for the fabrication and heat treatment of beryllium copper. 16 ref.

3-151. Improving the Impact Stress Endurance of a Carburized Gun-Part. K. B. Valentine. *Metal Progress*, v. 46, Sept. '44, pp. 467-472.

A hammer for an automatic gun was giving service failures from fatigue after about 5000 rounds. Tests are outlined showing how heat treatment, shot peening, and surface protection affected the endurance.

3-152. The Copper-Manganese Equilibrium System. R. S. Dean, J. R. Long, T. R. Graham, E. V. Potter, and E. T. Hayes. American Society for Metals. 1944 Preprint No. 9. 21 pp.

Study of the transition temperatures in pure electrolytic manganese confirms the existence of three points, alpha-beta, beta-gamma, and gamma-delta. Examination of copper-manganese alloys by thermal analysis, X-ray diffraction and metallographic methods established a copper-manganese equilibrium diagram differing from previously published diagrams by (A) the transition point in pure manganese, (B) position of the solidus, (C) extent of the gamma-beta field, and (D) placement of the alpha-gamma phase boundary. 25 ref.

3-153. Properties of Transitional Structures in Copper-Manganese Alloys. R. S. Dean, E. V. Potter, and J. R. Long. American Society for Metals. 1944 Preprint No. 10, 16 pp.

Single-phase tetragonal structures and high damping capacities found in furnace-cooled alloys are considered to result from strained lattice conditions in the initial stages of the decomposition. Anomalies in the resistivity and temperature coefficient of resistance are traced to the presence of epsilon. 8 ref.

3-154. Age Hardening Copper-Manganese-Nickel Alloys. R. S. Dean, J. R. Long, T. R. Graham, and C. W. Matthews. American Society for Metals. 1944 Preprint No. 11, 22 pp.

Hardenable copper-manganese-nickel alloys containing 22 to 24% manganese and equal amounts of nickel are shown to have the ability to harden to Rockwell C-45 and higher. Hardness may be controlled by regulation of aging times. Material hardened from the cold-worked condition responds more rapidly than the simple solution treated material. The physical properties of the alloy compare quite favorably with those of copper-beryllium alloys. The alloy made with electrolytic manganese has greater elongation at all hardness levels.

3-155. The Effect of Carbon Content on Hardenability. E. S. Rowland, J. Welchner, R. G. Hill, and J. J. Russ. American Society for Metals. 1944 Preprint No. 16, 27 pp.

End-quench hardenability determinations were conducted on S.A.E. 52XX and S.A.E. 46XX, with carbon ranging in 0.20% increments from approximately 0.20 to over 1.00%. Data are presented on the effect of carbon content on hardenability for the various conditions considered. The practical aspects of these results as affecting commercial heat treatments are evaluated and discussed. 6 ref.

3-156. The Partition of Molybdenum in Steel and Its Relation to Hardenability. Fred E. Bowman. American Society for Metals. 1944 Preprint No. 18, 14 pp.

Molybdenum segregates to the carbide when the isothermal transformation takes place at temperatures of 1200 and 1100° F. An explanation for the increased hardenability produced in steels by molybdenum is offered on the basis of the effect of this segregation and altered carbide structure on nucleation rates. The alpha iron lattice parameter versus molybdenum content relationship is extended to the room temperature solid solubility limit (6% molybdenum). 14 ref.

3-157. The Rate of Diffusion of Molybdenum in Austenite and in Ferrite. John L. Ham. American Society for Metals. 1944 Permit No. 19, 26 pp.

Coefficients of diffusion of molybdenum in pure austenite and ferritic iron-molybdenum alloys and in pure austenitic iron-molybdenum-carbon alloys. Composite nature of the diffusion coefficients of binary substitutional solid solutions discussed and diffusion and partition data used as the basis for an explanation of the effect of molybdenum on the shape of the S-curve.

3-158. New Developments in High Strength Aluminum Alloy Products. E. H. Dix. American Society for Metals. 1944 Preprint No. 20, 20 pp.

High compressive yield strengths obtained in products of three artificially aged aluminum alloys—24S-T8, 14S-T and 75S-T. Mechanical properties, yield strength and extrusions studied. 12 ref.

3-159. The Properties of Aluminum Alloys Melted in an Induction Heated Crucible Furnace. James W. Poynter. American Society for Metals. 1944 Preprint No. 22, 10 pp.

Physical properties of cast and heat treated test bars of aluminum alloys were determined. The metal from which these bars were cast was melted in a clay graphite crucible heated by induced high frequency electric currents. No fluxing treatment was used. The properties obtained were in excess of the minimum values required by the specifications.

3-160. Magnesium Sheet. P. T. Stroup, G. F. Sager, and J. B. West. American Society for Metals. 1944 Preprint No. 23, 28 pp.

Relation of mechanical properties of magnesium sheet to aluminum content, zinc content, and cold work. Improved resistance to corrosion was shown to result from a decrease in iron content. Stress corrosion cracking was overcome by means of magclad sheet. Forming and joining operations described. 30 ref.

3-161. A Comparison of Aluminum and Titanium Deoxidation for Preventing Strain Aging Embrittlement in Low Carbon Steel. George F. Comstock and John R. Lewis. American Society for Metals. 1944 Preprint No. 24, 14 pp.

Strain aging of low carbon steel, melted in an induction furnace and forged from small ingots; reports the results as affected by differences in forging practice and heat treatment as well as by different deoxidation. Methods of testing were (1) the work brittleness method, (2) impact tests after tensile straining, with and without aging, and (3) Brinell hardness tests at increasing temperatures up to 500° F.

3-162. The Ar' Reaction in Some Iron-Cobalt-Tungsten Alloys and the Same Modified With Chromium. W. P. Sykes. American Society for Metals. 1944 Preprint No. 25, 11 pp.

The ternary alloys of iron, cobalt, and tungsten exhibit a behavior similar to that of the steels as regards the eutectoidal decomposition, $\gamma = \alpha + \epsilon$. Chromium delays the onset of the reaction and appears to depress the position of the three phase field in which γ is stable. 3 ref.

3-163. Chromium Steels of Low Carbon Content. Russell Franks. American Society for Metals. 1944 Preprint No. 33, 22 pp.

Results of tests made on low carbon steels containing up to about 25% chromium. Wrought 3% chromium steels containing up to about 0.10% carbon are at least five times as resistant to atmospheric corrosion in industrial atmospheres as ordinary low-carbon steel.

3-164. Characteristics and Properties of Some Cast Chromium-Molybdenum Steels. N. A. Ziegler and W. L. Meinhart. American Society for Metals. 1944 Preprint No. 34, 39 pp.

5.0 to 9.0% chromium, 0.5 to 1.0% molybdenum steels commonly used in castings for corrosion and elevated temperature service are noted for their thermal sluggishness, which makes them susceptible to cracking during welding and heat treatment. Results of thermal analysis, metallographic examination, physical property determination, and welding experiments. 88 ref.

3-165. Segregation of Molybdenum in Phosphorus-Bearing Alloyed Gray Cast Iron. F. B. Rote and W. P. Wood. American Society for Metals. 1944 Preprint No. 35, 24 pp.

Phosphorus shown to be soluble in the particular irons studied to the extent of about 0.12%. Acicular microstructure is changed to a pearlitic structure as the phosphorus is increased sufficiently above the solubility limit. Segregation of molybdenum takes place on cooling from the iron-iron carbide eutectic to the iron-iron phosphide eutectic.

3-166. Factors Controlling Graphitization of Carbon Steels at Subcritical Temperatures. Charles R. Austin and M. C. Fetzer. American Society for Metals. 1944 Preprint No. 42. 46 pp.

Effects of mechanical treatment and thermal treatment above the critical, prior to subcritical graphitization; develops the role of environment on the progress of graphite formation. Role of subcritical graphite nucleation and of atmosphere also received experimental consideration. Results lend strong support to the suggested role of aluminum (calcium and silicon) oxide in promoting subcritical graphitization, when present in suitable form and suitable degree of dispersion. 7 ref.

3-167. Precipitation From Supersaturated Solid Solutions. H. K. Hardy. *Light Metals*, v. 7, August '44, pp. 383-409.

Age-hardening of aluminum alloys. 16 ref.

3-168. Future Steels. W. P. Eddy. *Iron and Steel*, v. 17, July '44, pp. 541-545.

Effect of wartime developments on specifications and uses.

3-169. Variable Heat Flow in Steel. R. Jackson, R. J. Sarjant, J. B. Wagstaff, N. R. Eyres, D. R. Hartree, and J. Ingham. Iron and Steel Institute, Advance Copy, July '44, 57 pp.

Methods for the calculation of variable heat flow have been devised which take into account the variable diffusivity of the material, latent heat of a change point and almost any surface conditions. Calculations made for the case of a steel ingot cooling in a mold also allowed for the radiative heat transfer across the air gap between ingot and mold and the different thermal properties of the two materials. The range of problems dealt with has been limited by the lack of adequate information on the thermal properties of steel. Two instruments, one mechanical and the other electrical, have been used for the calculation as well as numerical methods. 8 ref.

3-170. Chemical and Mechanical Properties of Some of the National Emergency Steels. William C. Stewart and Richard E. Wiley. *Journal* American Society of Naval Engineers, v. 56, August '44, pp. 396-411.

National Emergency Steels of the 8000 series offer much promise as alternate materials for forgings. These steels are well adapted for heat treatment by normalizing and tempering. Steels NE 9445 and 9450 failed to meet either AN or HG requirements when normalized and tempered at 1200° F. None of the samples showed any excessive amounts of non-metallic inclusions. Likewise, no flakes or cracks were encountered in the forgings. The average endurance ratio (ratio of endurance limit to tensile strength) for the 20 steels tested in rotating flexure is 0.43. This is somewhat lower than would be expected for alloy steels, and in this respect the steels are intermediate between carbon and alloy steels. The NE steels of this series are inferior to available high temperature bolting materials.

3-171. Factors Influencing Wear in Machines. D. Landau. *Machine Design*, v. 16, Sept. '44 pp. 105-108.

Surface melting. Ideal combination to resist galling; fretting starts with slip; 15 ref.

3-172. Effect of a High Antimony Content in the Tin Used in Making Bronze Alloys. Charles A. Reichelderfer. Bruce W. Gonser, and J. M. Blalock. American Foundrymen's Association *Transactions*, v. 52, Sep. '44, pp. 232-247.

Lower grade tin, containing less than 1.5% antimony (such as Texas Tin Smelter Alloy Metal) can be used in bronze alloys without harmful influence on the physical properties.

3-173. Hair-Line Cracks in Steel. D. Cathcart. *Metal Treatment*, v. 11, Summer '44, pp. 112-116, 111.

General position relating to hair-line cracks and dents in turn with methods of detection, the effect of hydrogen, steel composition, cooling stresses, steel making, etc., on the formation of these cracks, and finally with the methods available for preventing the presence of these cracks in the final worked and heat treated product. 6 ref.

3-174. Liquid Solubility of Manganese in Magnesium. N. Tiner. American Institute of Mining and Metallurgical Engineers. Preprint, Oct. '44, 6 pp.

The liquid solubility of manganese in magnesium is limited and depends on temperature and the amount of other alloying elements present; diagram of Ruhrmann as reported by Schmidt erroneous; the solid solubility of manganese in magnesium at the freezing point is less than 2.3% and the X-ray measurements of Schmidt and Siebel are incorrect, or the alloys show a peritectic reaction. 8 ref.

3-175. The Effect of Time and Temperature on the Relief of Residual Stress in Low Alloy Steels. Paul C. Cunnick and J. K. McDowell. American Welding Society Preprint, Oct. '44.

Information on the effect of time and temperature on the relief of residual stresses in high tensile, low alloy constructional steels.

4. STRUCTURE

4-33. The Dissociation of an Alloy of Copper, Iron, and Nickel; Further X-Ray Work. Vera Daniel and H. Lipson. *Royal Society Proceedings*, v. 182, June '44, pp. 378-387.

Intensities modified in a systematic way by extinction, and, after introducing a correction for extinction, the theory advanced can account for all the data. Bearing of the present observations on the kinetics of phase change discussed. 6 ref.

4-34. Internal Stress Created by Plastic Flow in Mild Steel, and Stress-Strain Curves for the Atomic Lattice of Higher Carbon Steels. S. L. Smith and W. A. Wood. *Royal Society Proceedings*, v. 182, June '44, pp. 404-414.

External applied stress above the yield is not balanced primarily by simple displacement of the atoms but by a new type of secondary internal stress brought about by the process of plastic flow; this secondary stress, being of a permanent nature, can be measured by the residual lattice strains exhibited by the lattice after removal of the external stress. 6 ref.

4-35. Etchant for Silver Solders. L. P. Tarasov. *Metal Progress*, v. 46 Sept. '44, page 484.

2% ferric chloride solution acts slowly enough to permit the structural details of the dark constituent to be revealed clearly. The desired degree of contrast is obtained by controlling the etching time, which is generally in the range of 5 to 30 sec.

4-36. The Dimensional Stability of Steel. Part I—Subatmospheric Transformation of Retained Austenite. Stewart F. Fletcher and Morris Cohen. American Society for Metals 1944 Preprint No. 27, 23 pp.

A combined X-ray and dilatometric procedure described for making a quantitative study of sub-cooling transformations. Detailed charts given to show the extent of austenite decomposition as a function of subatmospheric temperature and time of prior aging at room temperature. 28 ref.

4-37. Metallurgical Progress and the Chemist. *Chemical Age*, v. 51, August 5, '44, pp. 134-136.

Some recent developments.

4-38. Grain Shape and Grain Growth. David Harker & Earl R. Parker. American Society for Metals, 1944 Preprint No. 38, 40 pp.

Ability of a metal to show grain growth depends not at all on grain size but only on grain shape. When all grains in a metal have flat faces making 120° angles with adjacent faces, there can be no grain growth, no matter what the grain size. Some specimens show grain growth on annealing, others do not; but the grain shape always approaches that of the ideal stable structure.

5. POWDER METALLURGY

5-37. The Preparation of Aluminum Powder. A. G. Arend. *Paint Technology*, v. 9, April '44, pp. 79-80.

Practical details of methods of manufacture.

5-38. Metal Sponges. Carl Claus. *Metal Progress*, v. 46, Sept. '44, pp. 473-475.

Whereas porosity is an inherent property of powder compacts, and reduced or eliminated only be expensive operations, controlled porosity and permeability are the prime object of the producer's art. These factors are very adversely affected by such operations as reaming, boring, turning or grinding, all of which can usually be avoided if the purchaser will make known his true requirements in advance.

5-39. Determination of Particle Size in Powder Metallurgy. Philip R. Kalischer. *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, pp. 34-36, 42.

Gravitational fractionation with aid of photo cell applicable to process control.

5-40. Copper Powder Metallurgy. *Chemical Age*, v. 51, August 5, '44, p. 137.

Wide variety of components.

5-41. Bonding Metal Particles by Heat Without Pressure. Laurence Delisle. *Steel*, v. 115, Sept 18, '44, pp. 131, 134, 154, 156, 158, 160, 162, 164, 166.

Particle size greatly influences bonding and density of product. In working with iron, copper and silver, finer sizes provide better bond and denser structure; particle shape affects extent of bonding. Cold working powder lowers temperature for bonding.

6. CORROSION

6-40. Corrosion Testing of Water-Soluble Aluminum Cleaners. Jay C. Harris. American Society for Testing Materials *Bulletin*, no. 129, August '44, pp. 21-29.

Literature survey; corrosion tests defined by government specifications; basis for corrosion test for water-soluble aluminum cleaners; metal preparation; test conditions; method of tests; expression of corrosion test results. 18 ref.

6-41. Corrosion Prevention. *Steel*, v. 115, Sept. 4, '44, p. 94.

Improved by new wrapping system that protects packaged steel parts. Highly finished steel surfaces are protected against most severe shipping conditions.

6-42. Studies on Stress Corrosion Cracking of Austenitic Stainless Steels, Types 347 and 316. M. A. Scheil, and R. A. Huseby. *Welding Journal*, v. 23, August '44, pp. 361-s-363-s.

To check the statement that 18-8 steels containing ferrite are much more resistant to cracking in boiling $CaCl_2$ solutions than the wholly austenitic alloys.

6-43. The Mechanism of Failure of 18 Chromium—8 Nickel Cracking Still Tubes. C. L. Clark and J. W. Freeman. American Society for Metals. 1944 Preprint No. 12, 28 pp.

Results obtained from metallurgical examination of 18% chromium, 8% nickel cracking still tubes which had been in service for time periods ranging up to 97,520 hr. It is believed that the deterioration, and possible actual failure of 18-8 cracking still tubes in service is due to structural changes at the grain boundaries which are progressive in nature and are dependent on time, temperature and stress.

6-44. Corrosion Behavior of Magnesium Alloys. H. M. Muncheryan. *Iron Age*, v. 154, Sept. 7, '44. pp. 68-72.

Inclusions of flux particles in magnesium alloy castings in the presence of an electrolyte establishes a continuous chemical reaction that is disastrously corrosive. Inclusions can be prevented by careful foundry procedure. They may also be detected and repaired prior to the installation of castings in service.

6-45. The Protective Influence of Manganese in the Corrosion of Aluminum-Containing Magnesium Alloys. F. A. Fox and C. J. Bushrod. Institute of Metals *Journal*, v. 70, July '44, pp. 325-338.

Corrosion tests have been carried out on magnesium-base aluminum-containing alloys carrying varying manganese contents and, in one alloy to D.T.D. specification 325, varying iron contents. The corrosion rates obtained are compared with those reported in the American work. The results of these exploratory experiments indicate that the presence of an amount of manganese in excess of a certain critical limit is able to offset the accelerating influence of iron contamination on the corrosion rates of these alloys; in other words, the iron:manganese ratio seems to be a controlling factor. 9 ref.

6-46. Repairing a Cast-Iron Valve. Galen F. Biery. *Welding Engineer*, v. 29, Sept. '44, p. 45.

Pitting effects of corrosion were overcome by combining arc welding and metallizing on a large cast iron, bronze-seated relief valve.

6-47. Cracking and Embrittlement in Boilers. H. N. Boetcher. *Mechanical Engineering*, v. 66, Sept. '44, pp. 593-601.

Lists and describes, for identification, the characteristics of the principal types of cracks, cracklike penetrations, and embrittlement found in pressure parts of boilers, with particular emphasis on caustic cracking and a recently discovered type of cracks in high-pressure boilers.

(Continued on page 5)

The Metals REVIEW
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Jet Propelled Bomb Required Development Of Special Alloys

Jet propulsion, rocket projectiles, "bazookas", robot bombs and gas turbines are all linked together in the common use of white hot air or other gas as a source of energy. The principle on which they are based is old but its present applications have only recently been studied and intently developed, since they had to await the development of special alloys, reasonably cheap and workable, that can resist the stresses and scour imposed by the propellant for a useful time.

The story is told in a comprehensive review by the editor in the September issue of *Metal Progress*, page 497. The history of jet propulsion is traced from its early application to steamships in 1866. The present gas turbine—possibly better called a turbo-motor—is first cousin to a steam turbine, wherein the flywheel energy is secured, not from the action of expanding (and cooling) steam upon vanes at the rim of a wheel, but from a mixture of hot and compressed gases, principally air.

In jet propulsion, as applied to modern aircraft, the intervention of a propeller is dispensed with (but not the compressor for combustion air), the "shove" being the simple reaction equal and opposite to the hot exhaust. Robot bombs also utilize such a simplified "power plant," into which the necessary air for combustion is rammed by the high speed. Rocket artillery shells and bazookas also are propelled by hot exhausts, but both fuel and the oxygen for their combustion are contained in solid chemicals, semi-explosive in nature.

The *Metal Progress* article gives a detailed explanation of the construction and operation of these devices, further clarified by detailed diagrams and illustrations.

S-Curves Provide New Philosophy Of Heat Treating, Davenport Shows

Reported by Frank Sailer
Metallurgist, International Harvester Co., Tractor Works

How isothermal diagrams are built up, how the S-curves are made, and how to apply the data was explained to the Chicago Chapter A.S.M. on Sept. 14 by an authority on the subject, Edmund S. Davenport, assistant to vice-president, U.S. Steel Corp.

Slides illustrated the effects of common alloying elements, all of which except cobalt retard transformation or "push the curves to the right". Grain size also plays a significant part in shifting the curve.

To summarize rather tritely, the studies of the isothermal transformations in steels furnish a new framework for facts in the heat treating of steels and may be said to present a new philosophy or system of thought on the subject. The influence of temperature and time at which transformation actually takes place on the microstructure; why and how alloying elements increase hardenability; rational explanations of the influence of austenitic grain size; and a new viewpoint for the developing of new heat treating techniques; all can be learned from the S-curves.

Strain Hardening Prevents Obtaining Absolute Hardness

Reported by W. J. Sperko
Metallurgical Department, Youngstown Sheet & Tube Co.

We are actually testing strain hardening in addition to theoretical initial hardness when a Brinell impression is taken, Dr. E. G. Mahin, head of the metallurgical department at the University of Notre Dame, in his lecture on "Physical Testing in Theory and Practice" told the Calumet Chapter of the A.S.M. at Hammond, Ind., on Sept. 12. The material in the area indented is approximately two and a half times as hard as the original metal, Dr. Mahin further explained. A similar statement applies to other conventional hardness tests.

Because of the above factor and many others, the term hardness has proved difficult to define. A few conceptions were discussed but each seemed to lack at least one point so that they did not cover the total meaning of the term.

With the aid of slides, the speaker outlined the derivation of the Brinell hardness number and showed why it is inaccurate. A Meyer formula, $Mn = P/D^2$, where Mn = Meyer number and D = diameter of impression, was substituted. A series of experiments by Dr. Mahin and his associates at Notre Dame led to the following conclusions:

1. In the calculation of "absolute" hardness (initial hardness from strainless indentations) the Meyer formula should be used.
2. There is an average of 2 to 4 points difference between the Brinell and Meyer numbers.
3. The B. H. N. is most accurate when the impression is between ¼ and ½ the diameter of the ball.

In order to maintain the greatest possible precision of the Brinell test it was suggested that varying the load for the type of material tested would keep it in the desired range. Adoption of the Meyer formula would improve the Brinell test but metallurgists have standardized the Brinell test so much that "nothing short of an earthquake could make them change."

Other hardness testing instruments were discussed with the conclusion that the micro-hardness tester presents the most desired picture of a theoretically correct method for securing hardness.

During the coffee talk, Chairman H. H. Feirabend introduced the executive members to the well-attended gathering, after which was shown a motion picture depicting the splendid cooperation of production with the armed services in helping to win this war.

Robert G. Guthrie
Past President
American Society for Metals
1896-1944

ROBERT G. GUTHRIE, national president of the American Society for Metals in 1930 (then the American Society for Steel Treating), died suddenly on Sept. 20, 1944. He was a life-long and prominent member of the Chicago Chapter, serving on the executive committee and as chapter chairman during the 1920's.

For over 20 years he had been chief metallurgist for People's Gas Light and Coke Co., and was of so much aid in establishing sound heat treating methods in plants served by that utility that he became consulting metallurgist to a number of midwestern firms. In addition to this intensely practical work he was much interested in metallography and photography. He was a pioneer in the field of ultra high power microscopy, and it is the subject of several contributions to technical literature, a by-product of a long and useful professional career.

Machinability Ratings Explained

Prof. Orlan W. Boston (Left) and C. H. Lloyd, Chairman of West Michigan Chapter A.S.M., Discuss "Machinability of Metals."

Standardization of testing methods for machinability ratings of tools, cutting fluids and metals was illustrated by means of a series of slides accompanied by a detailed explanation, when Orlan W. Boston, professor of metal processing, University of Michigan, addressed the opening meeting of the West Michigan Chapter A.S.M. Professor Boston's lecture stressed the importance of having the right tools properly ground for each kind of material.

Coffee speaker was Howard I. Bobbitt, special FBI agent, who spoke on the technical work of his agency.

Contest Announced for Minnesota High School and College Senior Students

In order to stimulate metallurgical science and its application to industry in the Minneapolis-St. Paul region, the North West Chapter of the American Society for Metals has announced a contest for senior students in high school and college. Two prizes totaling $50 in cash for papers of the highest merit will be awarded.

An award of $25 to a senior high school student in the State of Minnesota will be based largely on the ability to assemble and present ideas and factual information acquired by reading, since opportunities for research are not available.

The college senior award of $25 will be on a research paper and the research must be performed by the author or co-authors.

All papers are to be submitted to the secretary, Alexis Caswell, North West Chapter, American Society for Metals, 200 Builders Exchange Bldg., Minneapolis 2, Minn., on or before June 15, 1945, and awards will be presented at the September 1945 meeting of the Chapter.

Mudge Gives History, Processing And Uses of Nickel at Dayton

Reported by T. E. Hamilton
Metallurgist, Delco Products Division, G.M.C.

The history, development, processing and uses of nickel opened the 1944-45 season of the A.S.M. Dayton Chapter meetings on Sept. 13. W. A. Mudge, assistant director of technical service on mill products, Development and Research Division, International Nickel Co., emphasized particularly the high nickel alloys containing 50% or more of nickel.

Dr. Mudge presented slides listing the different types of nickel alloys, their chemical compositions and physical properties. He supplemented his talk with a moving picture which showed the production of nickel from the ore to the finished nickel and the forming of nickel alloy rod and sheet from the ingot.

President, Secretary, Treasurer, Two Trustees on "Officers Night" Bill

Reported by R. L. Rickett
U. S. Steel Corp. Research Laboratory

President Grossmann, Secretary Eisenman, Treasurer McKinney and Trustees French and Krivobok were greeted by a large and enthusiastic audience at a real "National Officers' Night" of the New Jersey Chapter on Sept. 18.

Following the dinner Dr. Krivobok discussed briefly the role of metals in the aircraft, oil and paper industries of the west and northwest. The principal lecture of the evening was presented by President M. A. Grossmann, who spoke on "Hardenability of Steel and the Effect of Alloys." Considerable discussion followed, under the leadership of W. C. Schulte, technical chairman.

Metal Literature Review—*Continued*

7. PROTECTION

7-82. Metallizing Non-Conductors. I. Samuel Wein. *Metal Finishing*, v. 42, Sept. '44, pp. 534-538.

Historical survey; division of subject matter; basic steps necessary; advantages of metallizing; applications; mechanical films roughening the surface; conducting materials. 16 ref.

7-83. Rust Resistant Coatings for Steel Products. Jerome M. Bialosky. *Industrial Finishing*, v. 20, Sept. '44, pp. 22-23, 26-27.

Lacquer, paint, enamel coatings used on steel surfaces; paint coatings let in some moisture; surface treatment to prevent rusting; what phosphate coating does; methods of application; metal must be cleaned before being coated.

8. ELECTROPLATING

8-69. Continuous Electroplating of Steel Strip. D. A. Swalheim. *Iron & Steel Engineer*, v. 21, August '44, pp. 55-62, 82.

Since electro-coatings may be deposited to the thicknesses demanded by specific uses, electroplating will undoubtedly be applied even more extensively in the future. The deposits are more uniform in thickness and relatively pore-free in comparison to hot dip coatings. Electro-galvanizing of strip steel has been carried out successfully for some time. Lead, lead-tin alloys, copper, brass, nickel and different dual coatings may find extensive applications to strip steel.

8-70. Rubber Marking for Selective Plating. H. N. Nilson. *Tool Engineer*, v. 14, Sept. '44, pp. 88-90.

Search for a low-cost method of "stopping off" copper plating for selective carburization was intensified by need for partly plating tooth involutes. Foote Brothers Gear and Machine Corp.'s simple rubber masks improved over wax, tapes, and stop-off lacquers.

8-71. Electro-Deposition for Engineering Purposes. A. W. Wallbank. *Metal Treatment*, v. 11, Summer '44, pp. 131-134, 136.

Control, adhesion, sequence, time, selection; properties, thickness, reclamation, production, tools of chromium, nickel, copper, and other metals treated briefly.

8-72. The Properties of Acids. Samuel Glasstone. American Electroplaters Society *Monthly Review*, v. 31, Sept. '44, pp. 787-790.

Properties of acids, bases, and salts.

8-73. Passenger Car Equipment and Locomotives. T. R. Boggess, American Electroplaters Society *Monthly Review*, v. 31, Sept. '44, pp. 801-804.

Brass plating; copper plating; chromium plate over nickel plate; silver plated; zinc plating; hard chromium plating; passenger equipment cars; locomotives.

8-74. The Chemistry of Electroplating. C. B. F. Young. *Products Finishing*, v. 8, Sept. '44, pp. 30-32, 34, 36, 38, 40, 42, 44, 46, 50, 52.

Transition group composed of Fe and Co and Ni treated. Zn, Cd and Hg, and Sn and Pb studied.

8-75. Determination of Zinc in Cyanide Brass-Plating Baths. A. S. Miceli and I. O. Larson. *Metal Finishing*, v. 42, Sept. '44, pp. 547-548.

Procedure; limitations and errors. 5 ref.

10. ANALYSIS

10-47. Micro-Electrolytic Methods of Chemical Analysis. Henry J. S. Sand. *Metallurgia*, v. 30, June '44, pp. 107-109.

Deposition of metals from electrolytic solutions on passage of an electric current has been used to afford a means of gravimetric analysis. A number of the methods which have proved valuable on the ordinary laboratory scale adapted to the detection and determination of minute amounts of metals.

10-48. Quantitative Spectrographic Analysis of Copper Alloys. R. A. Wolfe and Emile J. Jemal. American Society for Testing Materials *Bulletin*, no. 129, August '44, pp. 45-52.

Elements largely determined at the 10% level, but an occasional analysis made with contents as high as 25%. Spectrographic sources discussed and a new type spark source suggested. Various details of the problem, such as errors due to sampling and corrections on the analyses due to interfering substances considered. Examples of working curves included.

10-49. Colorimetric Method for Determining Phosphorus in a Combined Form of Analysis. W. B. Sobers. *American Foundryman*, v. 6, Sept. '44, pp. 2-4.

Colorimetric methods of analysis, using optical or photometric methods to compare colors of solutions, offer economical methods for the average metallurgical control laboratory.

10-50. Identifying Nickel in Aluminum Alloys. L. J. Hibbert. *Metal Progress*, v. 46, Sept. '44, pp. 486-487.

Equipment and process for reliable methods for discriminating between non-ferrous metals of similar color and hardness, yet of different composition.

10-51. To Indentify Cadmium, Tin and Zinc Coatings. Birger L. Johnson. *Metal Progress*, v. 46, Sept. '44, p. 484.

Rapid methods of distinguishing metals by immersing the sample in a solution of one part commercial hydrochloric acid and one part water.

10-52. Spectrographic Analysis of Iron and Steel. H. F. Kincaid. American Foundrymen's Association *Transactions*. v. 52, Sept. '44, pp. 248-260.

Commercial grating spectrograph and the use of the flat surface method of sampling. Tables illustrating the lines used, excitation conditions, developing procedure, and the accuracy to be expected of the quantitative determinations of five elements from a single spectrogram are presented.

10-53. Analysis by Internal Electrolysis—A Semi-micro Method. James G. Fife. *Metallurgia*, v. 30, July '44, pp. 167-169.

Electrolytic methods, as adapted to dealing with small quantities of material. Interesting development is based on the deposition of metal without the use of an external current.

10-54. Microchemistry and its Borderline: The Instrument as an Analytical Tool. David L. Masters. *Metallurgia*, v. 30, July '44, pp. 169-170.

Microchemistry is now becoming so highly developed that a complete grasp of all the instrumental methods, which it must be held to include, is beyond the grasp of the average practitioner. Specialization, the obvious solution, will necessitate some readjustment of the system of using consultants, and a revision of the attitude towards the specialist consultant.

11. LABORATORY APPARATUS, INSTRUMENTS

11-91. Jewel Bearings for Aircraft Instruments. Paul Grodzinski and W. Stern. *Aircraft Production*, v. 6, August '44, pp. 369-372.

Manufacturing methods employed in the U.S.A.

11-92. Torquemeters Furnish Check on Machine Performance. F. W. Godsey and B. F. Langer. *Machine Design*, v. 16, Sept. '44, pp. 135-138.

Better-known types of aircraft engine torquemeters and introduces a new design of magnetic coupled torquemeter that recently has come through its development stage.

11-93. Electron Tubes—Their Principles and Their Instrumentation Applications. Andrew W. Kramer. *Instruments*, v. 17, Sept. '44, pp. 532-533, 554, 556.

Tubes and their classification.

11-94. Electric Gaging Methods for Strain, Movement, Pressure and Vibration. Howard C. Roberts. *Instruments*, v. 17, Sept. '44, pp. 534-535, 544, 546, 548, 550, 552, 554.

Gaging methods based on variations of resistance.

12. TESTING, INSPECTION AND RADIOGRAPHY

12-211. Determination of Discontinuities in Sheet Metal by Means of Ultrasonics. A. Trost. *Zeit. des Vereines Deut. Ingenieure*, v. 87, no. 23/24, June 12, '43, pp. 352-345. *Engineers' Digest*, v. 1, August '44, p. 493.

Wherever the waves encounter an air gap they will be reflected, and thus be prevented from penetrating the piece. These areas can be detected by probing the opposite surface of the sheet by means of an ultrasonic receiver. The sensitivity of fault detection depends upon the length of the ultra sound wave within the piece and upon the frequency.

12-212. Fatigue Testing of Metals. P. G. Soerensen. *Maskinteknik*, no. 22, March 25, '44, pp. 17-27. *Engineers' Digest*, v. 1, August '44, pp. 511-512.

Twenty-ton pulsator fatigue testing machine is an hydraulically operated unit permitting a maximum load variation of 20 tons within a range of 20 tons compression and 20 tons tensile loading. Its frequency can be adjusted at 750, 1000, 1500, or 2000 cycles per min. Working principle outlined.

12-213. Internal Stresses of I-Beams. R. V. Baud and M. Inan. *Schweizer Archiv*, v. 9, no. 9, Sept. '43, pp. 276-287. *Engineers' Digest*, v. 1, August '44, pp. 526-530.

Uneven cooling produces internal stresses, which could be calculated if the temperature as a function of time were known. Mathematical development of formula.

12-214. Abstract of the True Stress-Strain Tension Test—Its Role in Modern Materials Testing. C. W. Macgregor. *Franklin Institute Journal*, v. 238, August '44, pp. 111-135.

Application of the true stress-strain tension test in connection with metal forming processes, notched-beam-impact tests, fatigue tests, notch-effect tests, and combined stress experiments.

12-215. Pilot Rolling Mills. R. L. Hartford. *Steel*, v. 115, August 28, '44, pp. 114, 116.

Aid in checking physical specifications in relation to chemical composition.

12-216. Organic Coating Aids Magnetic Inspection. Gilbert C. Close. *Iron Age*, v. 154, August 31, '44, p. 41.

Coating that is quicker to apply and cheaper than the cadmium flash coating process, to apply a bright background for magnetic inspection.

12-217. A Numerical Rating Method for the Routine Metallographic Examination of Commercial Magnesium Alloys. P. F. George. American Society for Testing Materials *Bulletin*, no. 129, August '44, pp. 35-44.

Method for routine examination of these alloys, so inexperienced persons could record a microstructure. Such a method described and includes the specimen preparation, etching technique, and a rating system for recording the microstructure as a series of numbers.

12-218. Fluorescence as an Aid to Inspection. J. Brennan. *Metallurgia*, v. 30, June '44, pp. 70-72.

Underlying phenomena of fluorescent materials in their application for inspection purposes.

12-219. The Spectrograph as an Inspection Tool. J. D. Graham and H. F. Kincaid. *Metals & Alloys*, v. 20, August '44, pp. 355-358.

Outlines the principles of spectroscopy, describes the layout and methods used at International Harvester Co., and shows how successfully the machine operates as a composition-control tool.

12-220. Inspection by Projection. *Aircraft Production*, v. 6, July '44, pp. 307-308.

Application of Hilger equipment for checking quantities of small components.

12-221. Mechanized Inspection. *Machinery* (London), v. 64, June 29, '44, pp. 701-706.

Under the conveyor system of inspection, the handling of parts from the time they are machined until they are stored finished, or ready for the next machining operation, is mechanized.

Data on— 1-2-3-4 inch ALLOY BARS *with Every Shipment*

Ryerson furnishes a detailed data sheet showing Jominy Hardenability curves for the specific heat of steel supplied on every alloy shipment.

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The furnace is intended for fast and accurate heating for laboratory chemical analyses and metalurgical tests. In addition it will handle routine heat-treating jobs, including tools of high speed steel. See your laboratory equipment dealer now about this and other Lindberg laboratory furnaces.

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Metal Literature Review

12. TESTING & INSPECTION (*cont.*)

12-222. Stopper Heads X-Rayed to Eliminate Pouring Trouble. Clyde B. Jenni. *Foundry*, v. 72, Sept. '44, pp. 68-69, 208.

Internal defects of castings are disclosed by non-destructive testing, such as gamma-ray or X-ray examination; a similar study was proposed for the inspection of stopper heads. Short wave-length gamma rays were found to be less satisfactory for the examination of materials of densities of graphite-clay mixtures than the longer wave-length, low power X-rays.

12-223. Applying Fluoroscopy to Industrial Inspection. R. W. Mayer. *Foundry*, v. 72, Sept. '44, pp. 128, 136.

Limitations in use of fluoroscope for industrial inspection.

12-224. Ingenuity Cuts Hub-Bub Out of Hub Making. *Wings*, v. 3, Sept. '44, pp. 1209-1211.

Special engraving and inspection methods that prove fast and easy to use, and release expensive equipment for other work.

12-225. Effects of Notching on Strained Metals. G. Sachs and J. Lubahn. *Welding Journal*, v. 23, August '44, pp. 364-s-368-s.

Correlates the experimental evidence relating to notch effects in tensile specimens. Stress distribution and some conceptions of cohesive strength. 16 ref.

12-226. Mounting Small or Fragile Specimens. Gordon Sproule. *Metal Progress*, v. 46, Sept. '44, p. 484.

Preparing cross sections and longitudinal sections of fine wire in a lucite mount; pieces are gripped by folds in a strip of sheet lead, and pinched tight with pliers.

12-227. Identification of Specimen Mounts. R. L. Duffner. *Metal Progress*, v. 46, Sept. '44, p. 487.

Uses a vibrating type of electric marking tool to cut or scratch the identification on plastics.

12-228. A Comparison of Microhardness Indentation Tests. Douglas R. Tate. American Society for Metals. 1944 Preprint No. 1, 10 pp.

Tukon and Eberbach testers have extended the range of hardness tests to small areas, thin surface layers and brittle materials. Indentation numbers obtained with these machines are not independent of load, a fact which makes advisable an examination of the reasons for this lack of uniformity. Comparison data for the two testers throughout their common range of loads are presented.

12-229. Improved Sensitivity in Double Exposure Radiography. James Rigbey. American Society for Metals. 1944 Preprint No. 2, 13 pp.

Return made to the stereoscopic method of exposing two separate films. In order that precise measurements can be made of the shift of a flaw image to determine the vertical position of the flaw, the image of a lead marker is used as a reference point. The measurement may then be corrected for the known shift of the marker image and used as in the case of double-exposure radiography. In experiments with cast aluminum and steel blocks up to 2 in. in thickness, it was found that the consequent increased possible error in measuring the image shift does not appreciably alter the accuracy with which the position of the flaw is determined. 5 ref.

12-230. The Interpretation of Radiographs; Particularly of Aircraft Parts. Leslie W. Ball. American Society for Metals. 1944 Preprint No. 3, 30 pp.

Basic policy and procedure for the interpretation of radiographs. The objectives of radiography in the aircraft industry are stated. A system of identifying radiographic images with metallurgical defects is presented and methods are suggested for assessing the acceptability of defective parts.

12-231. Further Developments of the End Quench Hardenability Test. Charles R. Wilks, Earnshaw Cook, and Howard S. Avery. American Society for Metals. 1944 Preprint No. 6, 20 pp.

Hardenability test bar selectivity quenched from both ends has been developed to provide correlations with the thermal histories of quenched plates. For those steels where the pearlitic reaction may be avoided but which transform partially or wholly under the same cooling conditions to acicular structures of the bainite type, this test should be useful in predicting behavior at the section center, since the mechanical properties at the center of symmetrical double end quench specimens may be determined. 9 ref.

12-232. A Hardenability Test for Low Carbon and Shallow Hardening Steels. O. W. McMullan. American Society for Metals. 1944 Preprint No. 7. 19 pp.

Experiments and results obtained from jet quenching one face only of tapered or wedge shaped specimens and taking hardness readings along the other face of the wedge. By taking readings on a face oblique to the quenched face, rather than on one perdendicular to it as in the standard end-quench method, the hardened zones are greatly widened. This permits more readings and less error from inaccuracy of spacing. No cutting after hardening is necessary. Consistent results have been obtained on several types of steel. 4 ref.

12-233. The Effect of Fiber on Notched Bar Tensile Strength Properties of a Heat Treated Low Alloy Steel. George Sachs, J. D. Lubahn, L. J. Ebert and E. L. Aul. American Society for Metals. 1944 Preprint No. 14, 15 pp.

Regular and notched bar tensile tests on specimens taken in both the longitudinal and transverse directions from 1½ and 2¾-in. diameter, hot-rolled rod of a low alloy steel, S.A.E. 3140. Most of the specimens were heat treated to a strength level of 190,000 psi. The concentric notch ductility and the eccentric notch strength measured the ductility of the metal, as influenced by rod size and fiber direction, in nearly the same manner as shown in previous investigations. 4 ref.

12-234. Fractography—a New Tool for Metallurgical Research. Carl A. Zapffe and Mason Clogg. American Society for Metals. 1944 Preprint No. 36, 28 pp.

Fractography is the technique of studying untouched cleavage facets at high magnification. It offers many of the advantages of single-crystal methods, since the field is oriented about the cleavage plane; reveals much of the internal structure of the grain; time saved by avoiding mounting, polishing, and etching; and tiny chips and otherwise unusuable fragments are suitable for fractographic examination.

Employment Service Bureau

Address answers care of A.S.M., 7301 Euclid Ave., Cleveland 3, Ohio, unless otherwise stated. Applicants for the positions listed below are required to observe the rules and regulations of the War Manpower Commission regarding a Statement of Availability, if employed in an essential activity.

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There are many and varied openings in the professional and scientific fields. Both men and women who are not employed at the height of their skill in full-time war work are urged to apply. Full information may be obtained at any U. S. Civil Service office or from the local secretary, Board of U. S. Civil Service Examiners, at any first- or second-class post office.

Positions Open

METALLURGIST: Experienced in heat treatment of all types of tool steels, NE steels, S.A.E. steels, and non-ferrous metals. This work will involve diagnosing heat treatment and service failures, as well as specifying proper heat treatment for various applications. Good opportunity with a definite post-war future. Give age and complete details as to education and past experience. Box 9-5.

TOOL ENGINEER OR MECHANIC: Thoroughly familiar with tool set-ups and machining stainless, alloy, carbon steels. Required for customer contact work by steel distributor covering eastern states. State age, education, experience, draft status, availability, and salary expected. Replies strictly confidential. Box 9-10.

RESEARCH METALLURGIST: For research laboratory of large manufacturer of alloy and tool steels in the east. Preferably with several years' experience either in graduate work or in the steel industry. Good opportunity for permanent position. Statement of availability required. Box 9-15.

FORGE SHOP SUPERINTENDENT: Experienced flat die forging superintendent for large shop, 1500-lb. to large size hammers. Excellent position for capable man. Must be leader. Permanent. Tell all first letter. Box 9-20.

NON-FERROUS PHYSICAL METALLURGIST: Ph.D. desired, but not essential. Midwest. Salary open. Box 9-25.

PHYSICAL METALLURGIST: To take charge of research department in manufacturing plant in the New York area engaged in production of precious metal alloys. Metallographic and physical tests of precious metal alloys, looking to improvement of the alloys and shop processes; also studies of methods for making small castings. Responsibility for production testing and control. Post-war future assured. A good opportunity for a man of initiative, energy and ambition. Box 9-30.

MAN to take charge of sheet metal fabrication plant located in western Pennsylvania employing 300 men. Excellent post-war future. Must be capable of taking full charge of production and of supervising all phases of sheet metal fabrication, as well as ability to act as tool engineer in setting up new production lines. Give complete details as to experience, education, draft status, etc. Box 8-30.

METALLOGRAPHER: Experienced in preparing and determining metallographic specimens; experienced women may apply. NON-FERROUS METALLURGIST: For work on aluminum and magnesium. POWER METALLURGIST. METALLURGICAL ENGINEER: For development work on steel forgings, tool steels. RESEARCH METALLURGIST: Work on special alloys to be used at elevated temperatures. Write Supervisor, Technical Employment, 306 Fourth Ave., Pittsburgh, Pa. Westinghouse Electric & Mfg. Co.

MAN TO COORDINATE SALES and manufacture of tungsten carbide and cast alloy division of nationally prominent tool steel manufacturer. Position requires executive ability, experience in sales and familiarity with selling prices of carbide specialities and cast alloy tools, as well as ability to supervise production. Salary open. Give complete background; all replies held in confidence. Box 9-35.

SALES MANAGER: For well-established engineering organization devoted to design and construction of specialized industrial electric, gas and oil fired heat treating furnaces. Preferably experienced in directing and obtaining sales of specialized heat treating equipment or kindred lines. Location New England. Box 10-5.

PRODUCTION MANAGER: With foundry experience in manufacture of small hard alloy castings and hard facing welding rods. Rapidly growing New York firm. Box 9-85.

DEVELOPMENT ENGINEER: For development and manufacture of stainless steel and alloy steel welding electrodes and coatings. Chemical and metallurgical background preferred. Excellent post-war possibilities, since this man is to understudy our only engineer in this activity. Box 9-90.

FURNACE DESIGNER: Gas heat treating furnace design engineer; experience on radiant tube firing design. Location Pittsburgh. Box 9-105.

HEAT TREAT FOREMAN OR ENGINEER: Small company, completely converted to post-war work. Good opportunity and good salary plus bonus. Deco Products Co., 1480 Lakeside Ave., Cleveland 14, Ohio.

Positions Wanted

MELTER OR JUNIOR MELTER: For electric arc furnace shop. Metallurgical degree from a well-known engineering college; age 26. Over two years' experience in basic electric steel ingot production, including nearly a year of first helping. Anywhere east of the Mississippi. Salary open. Box 9-40.

SALES ENGINEER: Age 30, married, B.S. in mechanical engineering, credits on metallurgical degree. Eight years' experience in sales and technical service work on ferrous and non-ferrous alloys; experienced in sales supervision and development of new markets. Wide contacts in Pennsylvania, Ohio, West Virginia, and Maryland, including manufacturers of consumer products as well as fabricators of pumps, valves, power equipment and processing equipment. Box 9-45.

METALLURGICAL ENGINEER: M.S. in metallurgical engineering from midwestern engineering college; age 26, married. 1½ years' production experience in steel industry, 2½ years' research and development work on forming ferrous and non-ferrous alloys. Desires responsible position with a future in small, aggressive company. Box 9-50.

PHYSICAL METALLURGIST-CHEMIST: Heat treating methods, control heat treating department, plain and alloy steels; magnaflux; direction of metallurgical, metallographic and chemical laboratory; some experience in brass and zinc coated wire; dies, precision centrifugal steel casting; austempering. Reads several continental languages. Executive ability; above draft age. Box 9-55.

HEAT TREATER: Desires sales, service, or trouble shooting position. Over 25 years' practical and technical heat treating and metallurgical experience with leading companies. Five years' selling experience. Box 9-60.

METALLURGICAL ENGINEER: Ph. D. Experience in teaching physical metallurgy and welding research. Familiar with steel and magnesium metallurgy. Desires responsible position with company engaged in development and utilization of metals or with university teaching physical metallurgy and actively engaged in industrial research. Box 9-65.

METALLURGICAL ENGINEER: Desires position in Cleveland. B.S. in Metallurgy, Pennsylvania State College. Experienced in foundry operations, melting, planning and supervision in metallurgical and chemical laboratory, testing, welding, heat treating. Box 9-70.

WELDING METALLURGIST: Broad experience solving welding and brazing production problems. Now in charge of welding, development and trouble shooting, and radiography at ordnance plant. Supervisory experience. Position with post-war opportunity desired. Age 26. Location immaterial. Box 9-75.

HEAT TREAT FOREMAN: Twenty years' experience on tools and automobile and machine tool parts. Knowledge of metallurgy, chemical analysis and physical testing. Now in midwest. Box 9-80.

METALLURGIST: Graduate, experienced in supervision of metallurgical control and research laboratory, desires responsible permanent position with good post-war prospects. Five years with large steel manufacturer in production, fabrication, heat treatment and testing of carbon, alloy, and stainless steels; two years in processing of ferrous and non-ferrous metals including heat treatment. Territory optional. Minimum salary $8000. Box 9-95.

METALLURGIST-ENGINEER: Progressive, well equipped to handle problems from steel making to finished heat treated product, including specifications and purchasing. Medium size company with definite post-war future preferred. Age 30, graduate metallurgical engineer, $450 per month. Box 9-100.

New Welding Film Announced

"New Horizons in Welding" is the title of a 16-mm. sound film just released by the Harnischfeger Corp., Milwaukee, Wis. A 30-minute presentation, it deals primarily with the set-up for production welding, picturing the step-by-step procedure followed where welding is used on a high-speed, mass production basis. According to M. H. Rutishauser, manager of the P & H Welding Division, the film will be available to all interested groups—manufacturers, trade schools, government departments, and other organizations.

Readers interested in exhibiting "New Horizons in Welding" or in learning more of its contents should address the Harnischfeger Corp., Welding Division, 4400 West National Ave., Milwaukee 14, Wis.

Cramer Speaks on Rail Problems

Reported by J. F. Musgrove
Denver, Rio Grande & Western Railroad Co.

Prof. R. E. Cramer of the University of Illinois gave an illustrated talk on "Rail Problems" at the first meeting of the year of the Rocky Mountain Chapter held Sept. 15 at the Oxford Hotel, Denver. Preceding his talk the Past Chairman's Certificate was presented to Telfer E. Norman by Ray McBrian, and a Treasurer's Report was presented by Jack Torrey.

CHAPTER MEETING CALENDAR

CHAPTER	DATE	PLACE	SPEAKER	SUBJECT
Birmingham Dist.	Oct. 24	.....	Sam Tour	Heat Treatment in Controlled Atmosphere
Boston	Nov. 3	Hotel Sheraton	C. H. Herty, Jr.	Steel Making Practice As It Influences Properties of Interest to the User
British Columbia	Nov. 15	Hotel Vancouver		Joint Meeting with Canadian Institute of Mining and Metallurgy
British Columbia	Nov. 27	Brock Memorial Bldg., U. B. C.	H. B. Osborn, Jr.	Induction Hardening
Buffalo	Nov. 9	Hotel Statler	H. B. Osborn, Jr.	Induction Heating at War Today and in Peace Tomorrow
Canton, Mass.	Nov. 16	.....	C. E. Sims	Inclusions in Steel
Chicago	Nov. 9	Chicago Bar Assoc.	L. C. Bibber	Weldability of Steels
Cincinnati	Nov. 9	Engineering Society	P. Payson	Martensite Reactions in Alloy Steels
Cleveland	Nov. 6	Cleveland Club	B. F. Shepherd	Martempering
Columbus	Oct. 24	Fort Hayes Hotel	A. Allan Bates	Plastics vs. Metals
Columbus	Nov. 14	Fort Hayes Hotel		
Detroit	Nov. 13	Rackham Bldg.	Charles Lipson	Structural Considerations in Development of Automobile and Aircraft Parts
Ft. Wayne	Oct. 24	Chamber of Commerce	F. H. Allison, Jr.	Steel Rolling
Ft. Wayne	Nov. 28	Chamber of Commerce		Hardenability of Steel
Georgia	Nov. 6	The Duchess		Turning, Boring and Thread Cutting
Hartford	Nov. 14	Hartford Electric Light Co.	K. R. Van Horn	Metallurgy of Aluminum Alloys
Indianapolis	Oct. 23	Y. W. C. A.	A. Allan Bates	Industrialization of South America
Indianapolis	Nov. 20	Y. W. C. A.	K. R. Van Horn	Metallurgy of Aluminum Alloys
Lehigh Valley	Nov. 3	Hotel Bethlehem	E. L. Shaner	Post-War Metallurgy
Los Angeles	Nov. 23	Scully's Cafe	H. B. Osborn, Jr.	Induction Hardening
Mahoning Valley	Nov. 14	.....	B. W. Gonser	Rare Metals
Manitoba	Nov. 9	Marlborough Hotel, Winnipeg	Paul E. Lamoureux	Physical Metallurgy of Aluminum and Its Alloys
Milwaukee	Nov. 21	Milwaukee Athletic Club	Howard Taylor	Precision Castings
Montreal	Nov. 6	Queen's Hotel	W. G. Theisinger	Manufacture and Fabrication of Clad Steels
Muncie	Nov. 8	Y. W. C. A.		
New Haven	Oct. 26	Connecticut Light & Power Co., Waterbury	John K. Anthony and Ralph A. Schaefer	Trend in Sleeve Type Bearings
New Haven	Nov. 27	Hammond Lab., Yale University	Walter D. France	Effect of Alloying Elements on Copper Base Alloys
New Jersey	Nov. 20	Essex House, Newark	F. D. Foote, S. P. Watkins and E. B. Wilber	Materials for Strong, Light Weight Construction
New York	Nov. 13	.....	R. A. Grange	Intensified Steels
North West	Oct. 24	University of Minnesota	C. H. Sample	Protective Coatings
North West	Nov. 16	University of Minnesota	George M. Enos	Metallurgical Inspection in Ordnance
Northwest Pa.	Oct. 26	Press Club, Erie, Pa.	E. W. Engle	Powder Metallurgy
Notre Dame	Nov. 8	University of Notre Dame	L. H. Milligan	Surface Finish
Ontario	Nov. 3	Royal Connaught Hotel, Hamilton	E. R. Johnson	Electric Furnace Steel Making
Oregon	Nov. 24	.....	H. B. Osborn, Jr.	Induction Heating at War Today—at Peace Tomorrow
Philadelphia	Oct. 27	Engineers Club	N. I. Stotz	High Speed Steels
Philadelphia	Nov. 24	Engineers Club	K. R. Van Horn	Developments in Aluminum
Pittsburgh	Nov. 9	Roosevelt Hotel	R. P. Koehring	Power Metallurgy
Puget Sound	Nov. 17	Washington Athletic Club, Seattle	R. A. Seasholtz	Heat Treating
Rhode Island	Nov. 1	Providence Engineering Society	James B. Henwood	Rapid Flame Heating for Brazing and Hardening
Rochester	Nov. 13	Lower Strong Auditorium, University of Rochester	A. H. d'Arcambal	Precision Cutting Tools
Rockford	Oct. 25	Faust Hotel	W. E. Thomas	Magnetic Inspection
Rockford	Nov. 22	Faust Hotel	W. J. Conley	Fundamental Metallurgy as Related to Arc Welding
Rocky Mtn.	Nov. 16	Pueblo	Harry B. Osborn, Jr.	Induction Heating at War Today; at Peace Tomorrow
Rocky Mtn.	Nov. 17	Denver	Harry B. Osborn, Jr.	Induction Heating at War Today; at Peace Tomorrow
Saginaw Valley	Nov. 14	Frankenmuth, Mich.	V. M. Darsey	Corrosion Prevention
Schenectady	Nov. 14	Watervliet Arsenal	Capt. Les Gott	Precision Steel Castings
Springfield	Nov. 13	Sheraton Hotel	K. R. Van Horn	Applications and Age Hardening of the Aluminum Casting and Wrought Alloys
Syracuse	Nov. 8	.....	B. F. Shepherd	Martempering
Toledo Group	Nov. 22	Toledo Yacht Club	T. Barlow and V. Zang	Cast Iron vs. Cast Steel
Tri-City	Nov. 21	Hotel Ft. Armstrong, Rock Island, Ill.	K. R. Van Horn	Metallurgy of Aluminum Alloys
Warren	Nov. 9	I.O.O.F. Lodge Hall	K. R. Van Horn	Age Hardening of Metal
Washington	Nov. 13	Dodge Hotel	R. P. Koehring	Powder Metallurgy
West Michigan	Nov. 20	Grand Rapids	A. L. Boegehold	Alloy Steels
Worcester	Nov. 8	.....	Dr. R. F. Miller	Principles of Heat Treatment
York	Nov. 8	Steelton-Harrisburg	John MacDonald	Blast Furnaces

Corrosion of Magnesium Alloys Controlled by Fe-Mn Ratio

Recent American investigations of the corrosion of magnesium and its alloys have indicated that one of the predominating influences in producing reduced corrosion resistance is the presence of an iron content exceeding a limiting small amount.

Hanawalt and his collaborators state that iron when present in quantities which exceed about 0.017% in pure magnesium, and about 0.002% in the aluminum-containing alloys, leads to enhanced attack in salt water. This has led to considerable stress being laid on the elimination of iron from magnesium alloys which are to have good corrosion resistance.

The modifying influence of manganese on the corrosion behavior of the aluminum-containing alloys does not, however, seem to have been adequately studied in relation to these effects of iron. Such a study has been made in England and is described in the *Journal* of the Institute of Metals for July 1944 ("The Protective Influence of Manganese in the Corrosion of Aluminum-Containing Magnesium Alloys"; paper No. 968, page 325).

In this work corrosion tests have been carried out on magnesium-base aluminum-containing alloys with varying manganese contents and, in one alloy to D.T.D. specification 325, varying iron contents. The corrosion rates obtained are compared with those reported in the American work. The results of these exploratory experiments indicate that the presence of an amount of manganese in excess of a certain critical limit is able to offset the accelerating influence of iron contamination on the corrosion rates of these alloys; in other words, the iron-manganese ratio seems to be a controlling factor.

CALENDAR OF OTHER MEETINGS

Oct. 30-Nov. 1—American Gear Manufacturers Association. 27th Semi-Annual Meeting, Edgewater Beach Hotel, Chicago. (Newbold C. Goin, Executive Secretary, Empire Bldg., Pittsburgh 22, Pa.)

Nov. 2-3—Industrial Management Society. Eighth Annual National Time and Motion Study Clinic, Medinah Club, Chicago. (C. S. Becker, Vice-President, 205 W. Wacker Dr., Chicago 6, Ill.)

Nov. 13-14—Society of the Plastic Industry. Fall Meeting, Waldorf-Astoria Hotel, New York.

Nov. 15-19—Chicago Section, American Chemical Society. Third Biennial National Chemical Exposition and National Industrial Chemical Conference, Coliseum Chicago. (M. H. Arveson, 330 S. Wells St., Chicago 6, Ill.)

Nov. 27-Dec. 1—American Society of Mechanical Engineers. Annual Meeting, Hotel Pennsylvania, New York City. (Clarence E. Davies, Secretary, 29 West 39th St., New York 18, N. Y.)

Nov. 27-Dec. 2—Sixteenth National Exposition of Power and Mechanical Engineering, Madison Square Garden, New York City. (Charles F. Roth, President, International Exposition Co., 480 Lexington Ave., New York 17, N. Y.)

G. A. Ostrom Moves to Foote Mineral

Foote Mineral Co., Philadelphia, has announced the retention of Gustuf A. Ostrom as a research engineer. Mr. Ostrom, a graduate of Girard College, and a certified physical metallurgist, comes to his new post after four years as a radio technician with Philco Radio Corp., and six years research and development work with Arcos Corp. on stainless steel and alloy welding electrode coatings and weld deposits, metallurgical control of raw materials and finished products.

Mr. Ostrom has also taught metallurgical laboratory practice at Temple University Evening School, and is a member of the Philadelphia Chapter A.S.M.

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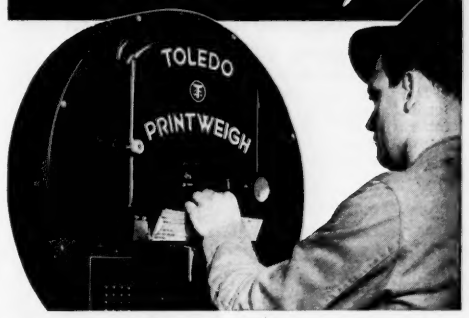

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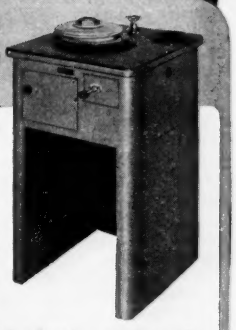
METALLURGICAL TESTING

Precision work requires accurately molded and polished specimens

• A smooth-running vibrationless polisher encourages careful precision polishing

Buehler

specimen preparation equipment produces reliable results with speed and accuracy.



SINGLE UNIT POLISHING TABLE NO. 1516

This cabinet type polisher combines the features of a smooth-running precision mechanism with unusual convenience and comfort for the operator. In addition to the polishing unit this table is equipped with a handy wash fountain and desicator cabinet for keeping specimens in good condition. The two speed control switch is placed in a convenient position and the entire unit is arranged for a high daily production of specimens. Every mechanical part of this polishing unit is finished to close tolerances and balance so that peripheral vibration is reduced to a minimum. The polishing disc is keyed to a tapered arbor on the motor by means of a stout sleeve. The disc is equipped with a new type cloth clamp for quick changing.

LEAD LAPPING DISC NO. 1526

Interchangeable with the regular 8" disc on all Buehler polishers, the new polishing technique of the lead lapping disc is ideal for difficult metal specimens. The results are extreme flatness of specimens, a minimum of disturbed metal, retention of graphite and inclusions, and true dimensions on electro plate specimens. This method of polishing is gaining widespread popularity because of improved results.

The BUEHLER line of specimen preparation equipment includes — Cut-off Machines • Specimen Mount Presses • Power Grinders • Emery Paper Grinders • Hand Grinders • Belt Surfacers • Polishers • Polishing Cloths • Polishing Abrasives.

Buehler Ltd.

METALLURGICAL APPARATUS
165 West Wacker Drive
CHICAGO 1, ILLINOIS

Mention R548 When Writing or Using Reader Service.

A.S.M. Review of Current Metal Literature — *Continued*

12. TESTING AND INSPECTION (*Cont.*)

12-235. **"Strength" in Technical Parlance.** A. C. Vivian. *Metallurgia*, v. 30, July '44, pp. 127-129.

The term "strength" is in general used so frequently for different purposes that its meaning has become somewhat confused; even descriptions by technicians are vague, yet in its application to metals it is important that there should be no ambiguity in its use concerning the property of the metal or alloy under consideration. To overcome confusion the author presents a proposal for the use of the word in technology.

12-236. **Metallurgical Examination of Light Alloy Cylinder Heads from German Aircraft.** *Metallurgia*, v. 30, July '44, pp. 159-162.

Summary of data resulting from the metallurgical examination of parts from enemy aircraft carried out at the request of the Committee on Non-Ferrous Metal Parts of Enemy Aircraft. The parts examined were three cylinder heads taken from Bramo-Fafnir 323, B.M.W. 132, and B.M.W. 801 engines.

12-237. **Inspection Methods for Quality Control.** *Die Casting*, v. 2, Sept. '44, pp. 64, 66, 68.

Quality control assures uniform and consistently good results in the application of die castings. Equipment employed by the General Electric Co. in commercial checks and in research and development on die castings.

12-238. **Strengthening of Circular Holes in Plates Under Edge Loads.** Leon Beskin. *Journal of Applied Mechanics*, v. 11, Sept. '44, pp. A-140-A-148.

Stress distributions determined around strengthened circular holes in plates submitted to edge loads at infinity.

12-239. **Conditioning of Steel Castings to Standards of Quality.** Paul Ffield. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 173-204.

Evaluation of integrity; application of non-destructive tests; influence of non-destructive testing on the conditioning of castings; radiographic standards of acceptability; practicability of magnetic powder standards; standardization necessary for uniformity of test results; interpretation of the magnetic powder test; significance of cracks in high-pressure, high-temperature castings; magnetic powder inspection as a complement to radiography; value of magnetic powder method of inspection; responsibility for integrity; flame excavation of defects; magnetic inspection of flame gouged areas.

12-240. **Magnetic Powder Inspection of Large Castings.** John F. Cotton. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 205-231.

Variables involved in magnetic powder inspection. Standards should be established to govern the variables encountered in the application of this method of inspection. Evaluates the variables quantitatively. Shows that a standardized technique must be established before standards of magnetic powder inspection can be prepared.

12-241. **The Micro-Topography of Finely-Finished Reflecting Surfaces.** J. Ferdinand Kayser. *Machinery* (London) v. 65, July 27, '44, pp. 85-89.

A method for quantitatively determining the micro-topography of finely finished reflecting surfaces, surfaces on which the maximum depths of the scratches or surfaces imperfections are of the order of 1_{μ} (40 micro-inches) or less.

12-242. **The Non-Destructive Testing of Metallic Components.** Bruce Chalmers. *Metal Treatment*, v. 11, Summer '44, pp. 117-123.

Methods in use for the non-destructive testing of metals. Deals, in turn, with the application of those methods in measuring dimensions, detecting flaws, estimating physical properties, and examining surfaces.

12-243. **Radiography of Light Alloy Castings.** C. T. Snushall. *Light Metals*, v. 7, August '44, pp. 375-382.

Applications of filters and intensifying screens.

12-244. **Standards for Surface Quality and Machine Finish Designation.** James A. Broadston. *Product Engineering*, v. 15, Sept. '44, pp. 622-625.

Possible effects of surface quality on strength and functioning of machine or structural members. Surface irregularities that define quality, methods of measuring roughness and standard roughness values are described.

12-245. **Spot Weld Inspection Methods.** D. J. Rahn. *Welding Engineer*, v. 29, Sept. '44, pp. 42-44.

Policies and personnel of "Inspection" contribute as much to the quality of the individual weld as the operator's ability or the perfection of his equipment.

12-246. **Failures in Cold-Headed Machine Bolts.** Herbert R. Isenburger. *Steel*, v. 115, Sept. 18, '44, pp. 116, 118.

Characteristic failure of defective bolts studied was a separation of the head from the shank under comparatively slight tension of transverse impact. The regular and almost polished character of the exposed metal surface suggested that the defect causing the failure was a rupture within the head. X-ray examination was used to determine whether ruptures were present before breakage, and whether these ruptures always occurred in a particular zone or might take place anywhere in the head.

12-247. **The Bi-Axial Fatigue Strength of Low Carbon Steels.** G. K. Morikawa and L. V. Griffis. American Welding Society Preprint, Oct. '44.

Basic information on the fatigue strength of metals, unwelded and welded, subjected to cyclic combined stresses: silicon-killed. SAE 1020 steel was investigated using thin-walled tubular specimens machined from solid bar stock. Comparison of the fatigue strength of welded and normalized mild steels.

12-248. **How Much Ductility Is Necessary for a Structure or Machine.** W. J. Conley. American Welding Society Preprint Oct. '44.

Explanation of the action of metal during elongation and differentiation between elongation as measured by the tensile test and the true value. Conditions which may change action of metals so that they are not able to show normal elongation or yield and means for avoiding this condition by correct design explained.

12-249. **X-Ray Control in the Magnesium Foundry.** Robert Taylor. *Light Metal Age*, v. 2, Sept. '44, pp. 30-31, 39.

Common faults to be found in the production of magnesium sand castings; shows the part X-ray can play in foundry control and offers a suggested design and arrangement for a small foundry X-ray unit.

12-250. **The Effect of Stray Radiations in X-ray Inspection of Light Metals.** Robert Taylor. *Western Metals*, v. 2, Sept. '44, pp. 25-26, 29-30.

The effect is to reduce the legibility of an image by producing an increased "foglike" density which is undesirable in the production of high quality radiographs. 4 ref.

12-251. **Industrial X-Ray Units.** *Steel*, v. 115, Sept. 25, '44, pp. 112, 114.

Speed ordnance production. Fast, automatic shell inspection lowers number of rejects at three U. S. plants.

13. TEMPERATURE MEASUREMENT AND CONTROL (PYROMETRY)

13-32. **Color-Temperature Scale: Part I.** W. E. Forsythe and J. Q. Adams. *General Electric Review*, v. 47, Sept. '44, pp. 26-34.

Lamp or furnace temperature best determined by measuring specific brightness. 14 ref.

13-33. **Temperature Control of Die Casting.** M. D. Pugh. *Tool and Die Journal*, v. 10, Sept. '44, pp. 115-117.

The highest quality of die castings either as to strength, density or finish is dependent on temperature of the metal, temperature of the mold and time cycle of the casting operation.

13-34. **Basic Principles of Combustion Engineering of Hot-Dip Galvanizing Furnaces.** Wallace G. Imhoff. *Industrial Gas*, v. 23, Sept. '44, pp. 19-21, 39-40.

The value of electric recording pyrometers, and automatic fuel control in hot-dip galvanizing furnace operation.

14. FOUNDRY PRACTICE AND APPLIANCES

14-291. **Steel Castings — Centrifugally Cast.** James W. Moore. *Metals & Alloys*, v. 20, August '44, pp. 365-368.

The types of centrifugal castings; fields of use (especially in competition with other forms); and shapes and products for which steel castings, centrifugally cast, are especially useful.

14-292. **The Effect of Some Variations in Casting Procedure on the Properties of Degassed Chill-Cast 10% Tin Bronze.** W. T. Pell-Walpole and V. Kondic. Institute of Metals *Journal*, v. 70, June '44, pp. 275-289.

Properties of 10% tin bronze, degassed by melting under an oxidizing flux and cast into chill strip moulds, studied with respect to the effects of rate and temperature of pouring, position and number of the pouring streams, iron and copper molds, and mold temperature and dressings. The properties examined were characteristics of surface and fracture, macro- and microstructure, density, tensile and impact strength, and rolling properties. The nature and amount of porosity present under different casting conditions have a great influence on properties.

14-293. **The Injection of Metal Into Die Casting Dies.** H. K. Barton. *Machinery* (London), v. 64, June 29, '44, pp. 721-723.

As the metal is projected along the die surface, the chilling of that side of the stream which is in contact with the die intensifies the viscous shear. Local irregularities in the thickness of the initially projected skin may offer so much resistance to newly injected metal. Air penetrating beneath the initially projected skin is usually expelled by the prevailing hydraulic pressure as the cavity fills, but should the skin be soft, trapped air may coalesce to form bubbles.

14-294. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. *Foundry Trade Journal*, v. 73, June 29, '44, pp. 175-181.

Women more proficient in this type of work than men.

14-295. **Malleable Cast Iron. I.** J. A. Wylde, *Metallurgia*, v. 30, June '44, pp. 86-89.

Historical outline of the development of Whiteheart and Blackheart malleable castings.

14-296. **Precision Castings Employing Dental Technique by Investment Molding Process.** Robert Neiman. *American Foundryman*, v. 6, Sept. '44, pp. 5-12.

History of the process and shows how the dental technique is employed.

14-297. **Castings From the Consumers' Viewpoint.** L. A. Danse. *American Foundryman*, v. 6, Sept. '44, pp. 13-15.

Matters pertaining to inspection of castings, which will benefit both the user and producer.

14-298. **Gray Iron—Steel Plus Graphite.** James T. Mackenzie. *Foundry*, v. 72, Sept. '44, pp. 70-72.

The effect of graphite on the mechanical properties of gray cast iron.

14-299. **Foundry Metallurgy of Die Castings.** James L. Erickson. *Foundry*, v. 72, Sept. '44, pp. 73, 192, 194, 196.

Controlling factors.

14-300. **Water Quenching Large Steel Castings.** R. A. Gezelius. *Foundry* v. 72, Sept. '44, pp. 74-77, 176, 178.

Large castings as well as smaller ones are being water quenched successfully. Equipment employed in some plants for handling castings in this process is semi-automatic in its operation.

14-301. **Cupola Practice.** Donald J. Reese. *Foundry*, v. 72, Sept. '44, pp. 79, 202, 204-206.

Weight of fuel charges, proper coke bed height, zones in the cupola, and air supply are important factors in efficient cupola operations.

14-302. **Aluminum Castings by Dodge Chicago Plant.** William G. Gude. *Foundry*, v. 72, Sept. '44, pp. 80-83, 198, 200.

Methods used in making the finned cylinder head.

14-303. **Rapid Routine Methods for Slag Analysis.** Robert A. Willey. *Foundry*, v. 72, Sept. '44, pp. 87, 180, 182, 184.

Rapid and reasonably accurate methods for slag control. 4 ref.

14-304. **Mechanical Handling in Foundries.** *Foundry Trade Journal*, v. 73, July 13, '44, pp. 207-213.

The major stages in the handling of materials for the production of castings.

14-305. **Mechanical Handling in Foundries.** *Foundry Trade Journal*, v. 73, July 27, '44, pp. 259-261.

Major stages in the handling of materials for the production of castings. Fettling shop.

14-306. **Sandslinger Moulding Practice.** W. Y. Buchanan. *Foundry Trade Journal*, v. 73, July 27, '44, pp. 249-253.

Sandslinger as a general-purpose machine.

14-307. **Sandslinger Moulding Practice.** W. Y. Buchanan. *Foundry Trade Journal*, v. 73, August 3, '44, pp. 275-278.

Sandslinger as a general-purpose machine; feeding the Sandslinger; types of castings; savings in time.

14-308. **An Outline of Gravity Die-Casting.** M. R. Hinchcliffe. *Foundry Trade Journal*, v. 73, August 3, '44, pp. 269-273.

Survey of development in its application; improvement in mechanical properties; scope; magnesium die castings; copper-base alloys; die design; running-systems—the flow of the metal.

14-309. **Development of a Flux Degassing Process for Chill-Cast Tin Bronzes.** W. T. Pell-Walpole. *Foundry Trade Journal*, v. 73, August 17, '44, pp. 307-310, 312.

Experiments to meet the requirements for a successful oxidizing flux process.

14-310. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. *Foundry Trade Journal*, v. 73, August 17, '44, pp. 313-319.

Fixed steel content with varying amounts of inoculant; heat treatment.

14-311. **Steel Mixes and Inoculants in Grey Cast Iron.** W. Barnes and C. W. Hicks. *Foundry Trade Journal*, v. 73, August 24, '44, pp. 337-341.

Assumption that melting of steel in cupolas is a difficult practice is entirely false. Low-temperature treatment; Jominy hardenability tests; internal soundness.

14-312. **Developments in the Design and Use of Side-Blown Converter Plants.** P. C. Fassotte. *Foundry Trade Journal*, v. 73, August 24, '44, pp. 329-334.

Advantages and disadvantages of the process outlined.

14-313. **The Bonding Properties of Mixtures of Petroleum Extracts and Linseed Oil and of the Extracts Themselves.** Iron and Steel Institute Advance Copy, July '44, 19 pp.

Results obtained show that petroleum extracts, produced at refineries in Great Britain as a by-product in the purification of the lubricating-oil fraction from the distillation of crude petroleum, can be used satisfactorily to replace at least 40% of the linseed oil in core-sand mixtures. This replacement is advantageous economically, as the petroleum extracts are at present much lower in price than linseed oil, and there is the additional advantage of utilizing a home-produced by-product.

14-314. **The Influence of Centrifugal Casting (Horizontal Axis) Upon the Structure and Properties of Metals.** L. Northcott and V. Dickin. Institute of Metals *Journal*, v. 70, July '44, pp. 301-323.

Thick cylinders of three alloys—aluminium with 6% copper, 6% tin bronze, and 70:30 brass—were cast in a horizontal-axis centrifugal-casting machine, using chill molds without a central core. The casting conditions were varied in respect of mold speed, casting temperature, rate of pour, and mold temperature, and the castings were examined to determine the influence of these factors upon structure. 4 ref.

14-315. **Synthetic Sands in the Steel Foundry.** H. E. Crivan. *Metal Treatment*, v. 11, Summer '44, pp. 91-102.

Research into the merits of synthetic sands. These comparatively new products will continue to be used even when other supplies are more readily available; hot tests, effect of milling times on properties of sands; effect of ramming on physical properties of synthetic sands; semi-oil sand mixtures. 7 ref.

14-316. **Malleable Cast Iron. II.** J. A. Wylde. *Metallurgia*, v. 30, July '44, pp. 123-126, 129.

The metallurgical characteristics of both whiteheart and blackheart types, and describes production. Comparisons are made of the structures of both types in the unannealed and annealed conditions.

14-317. **The Ironfounding Industry and Co-operative Research.** Harold Hartley. *Metallurgia*, v. 30, July '44, pp. 149-151.

The variety in weight, technical complexity and application of the products of the iron foundry is enormous; developments in the last two decades have greatly increased the standard of the products. Coordinated effort. The value of cooperative research.

14-318. **Centrifugal Casting.** J. E. Hurst. *Iron and Steel*, v. 17, July '44, pp. 533-536.

Rotational speeds used commercially in centrifugal casting, both for rotation about vertical or horizontal axes or combinations of these.

14-319. **The Production of Aluminum Gravity Die Castings.** John Vickers. *Machinery* (London), v. 65, July 27, '44, pp. 105-108.

Advantages to be gained by die casting.

14-320. **Steel Castings for Aircraft.** *Aircraft Production*, v. 6, August '44, pp. 359-361.

Production of the undercarriage pivot bracket casting for the Hawker Typhoon fighter by Hadfields, Ltd.

14-321. **Industrial Precision Castings by a Manufacturing Jeweler.** J. Albin. *Iron Age*, v. 154, Sept. 7, '44, pp. 73-77.

Precision casting by the conventional "lost wax" process.

14-322. **Making Practice Bombs.** *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, pp. 22-27.

The molding and pouring set-up, and the associated mechanized features required to produce approximately 35,000 bomb castings per week on one shift; melting, core production and sand conditioning.

Albert L. Marsh Dies, Was Pioneer in Ni-Cr Alloys

Albert L. Marsh, president and general manager of the Hoskins Manufacturing Co., Detroit, and recipient in 1941 of the Albert Sauveur Achievement Award of the A.S.M., died on Sept. 17, at the age of 67.

Albert L. Marsh

He had been twice honored for his achievements in the field of nickel-chromium alloys, having received the John Price Wetherill Medal of the Franklin Institute in 1936 "for significant and timely contributions to the science of automotive engineering."

The alloys that Mr. Marsh developed became the original nickel-chromium resistors for electric heating, and the story of their development was told in a biographical appreciation of Mr. Marsh in the May 1935 issue of *Metal Progress.*

Raleigh H. Barnes

Raleigh H. Barnes, 46, assistant director of research of the American Steel & Wire Co., died suddenly on Sept. 2 of coronary thrombosis.

Upon graduation from Case School of Applied Science, Mr. Barnes was hired in 1920 as a laboratory assistant at the Newburgh Steel Works of American Steel & Wire Co. In 1937 he was named assistant district metallurgist in the Cleveland district manager's office. He was appointed assistant director of research in May 1944.

James L. Avis

James L. Avis, consulting metallurgist, a long-standing member of the American Society for Metals, died in Seattle, August 2, 1944.

Georgia Tech Offers Evening Classes

Two free evening classes in plastics and metallurgy are being offered at Georgia Institute of Technology during late October and early November, according to H. V. Grubb, chairman of the Educational Committee of the Georgia Chapter, A.S.M.

The subject of plastics is covered in a 12-week course of two sessions per week plus six hours per week of laboratory work. The metallurgy course covers 16 weeks, two sessions per week, and also includes laboratory work.

Fred Wood Returns to Detroit for Wm. Jessop

After a year and a half as Canadian manager for Jessop Steel Co., Fred J. Wood has returned to Detroit to become Michigan manager of Wm. Jessop & Sons, Inc. A new warehouse is being built in the Detroit area for the distribution of Wm. Jessop tool steels.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACTS OF CONGRESS OF AUGUST 24, 1912, AND MARCH 3, 1933

Of THE METALS REVIEW, published monthly at Cleveland, Ohio, for October 2, 1944, State of Ohio, County of Cuyahoga, ss. Before me a Notary Public in and for the State and county aforesaid personally appeared Ray T. Bayless, who, having been duly sworn according to law, deposes and says that he is the Editor of THE METALS REVIEW of the American Society for Metals, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations to wit:

1.—That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, American Society for Metals, 7301 Euclid Ave., Cleveland 3, O.; Editor, Ray T. Bayless, 7301 Euclid Ave., Cleveland; Managing Editor, M. R. Hyslop, 7301 Euclid Ave., Cleveland, O.; Business Manager, Ray T. Bayless, 7301 Euclid Ave., Cleveland, O.

2.—That the owner is: The American Society for Metals, 7301 Euclid Ave., Cleveland, O., which is an educational institution, the officers being: President, M. A. Grossmann; Vice-President, K. R. Van Horn; Secretary, W. H. Eisenman; Treasurer, H. D. McKinney; Trustees: Erle G. Hill, V. N. Krivobok, C. H. Herty, Jr., A. L. Boegehold, H. J. French. All officers as above, 7301 Euclid Ave., Cleveland, Ohio.

3.—That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

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Ray T. Bayless, Editor.

Sworn to and subscribed before me this 2nd day of October, 1944. (Seal) Arthur T. Wehrle, Notary Public. (My commission expires Jan. 20, 1947.)

Permeable Refractories In New Type Furnace

A new principle in gas-fired furnace design has been developed in England by R. H. Anderson, D. C. Gunn and A. L. Roberts and is summarized in the July 21st issue of *Metal Industry* and the Sept. 7th issue of *The Iron Age.*

A furnace heated by the combustion of gases has always been held to comprise a combustion chamber, a chamber in which the goods are heated, and a flue through which the products of combustion are removed from the furnace. The new principle involves the use of permeable refractories through which furnace gases are withdrawn from the furnace chamber rather than through a flue.

Among the characteristics of the newer insulating refractories that are now employed in hot face insulation is high permeability to gas flow. This has been regarded hitherto as a difficulty overcome by backing the insulating refractory with a normal refractory of low permeability. The authors, however, conceived the idea that the gases could be withdrawn from the furnace chamber through the pores of the refractory, if it was made sufficiently permeable, and that considerable benefits would result.

The furnace chamber is built of permeable refractories (open-textured insulating firebricks), behind which is a space, which in turn is backed by a normal firebrick wall. If the pressure on the furnace side of the wall is sufficiently greater than on the side farther from the furnace, the products of combustion will pass through the wall.

Several of these furnaces have been in industrial operation for some time, and have shown considerable fuel saving and more uniform heating of furnace chambers, according to the data presented by the authors.

Birmingham District Plans for Fall and Winter Activities

Reported by Grant S. Shoop
Inspection Engineer

Plans for the fall and winter activities of the Birmingham District Chapter of the American Society for Metals are being made by the Executive Committee under the chairmanship of Major Robert S. Crowder. The program for the meetings is being arranged by Charles K. Donoho, the vice-chairman, and will consist of monthly dinner meetings with speakers of national reputation emphasizing the part which the various metals will have in the post-war period. Topics of general interest will be included in the arrangements.

The work of the Educational Committee is being handled by Ray Frings, and A. S. Stephens continues to head up the Membership and Attendance Committee. Publicity matters for the Chapter were assigned by Major Crowder to G. S. Shoop, and the other members of the Executive Committee are J. H. Caldwell, representative on the Engineering Council, and Wm. H. Riddell, survey and promotional activities.

It is planned to hold meetings on the third Tuesday of the month. It is the intention of this Chapter, as expressed at the last meeting of the Executive Committee, to expand new uses for metals to the best of its ability. The local membership, totaling about 140, will be called upon for full participation in the interests of practical and economic uses of metals after the war.

Babcock Opens St. Louis Fall Season

A well-presented, illustrated talk by H. J. Babcock, research engineer of the Ajax Electric Co., Inc., started the fall season of the St. Louis Chapter. His subject, "Immersed Electrode Salt Baths in Modern Heat Treating Practice," was both interesting and instructive, and was well received by a good turnout of the local members.

Made Philadelphia Manager Pressed Steel

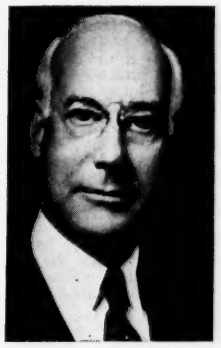
James A. Quaid, formerly sales engineer, Allegheny Ludlum Steel Corp., Philadelphia, has been appointed Philadelphia district manager of the Pressed Steel Co. and will open an office in the Broad Street Station Bldg., Philadelphia.

Named Advertising Manager for Diversey

Carl E. Richards, formerly advertising manager of Vestal Chemical Laboratories, St. Louis, has been appointed Advertising Manager of The Diversey Corp., Chicago, specialists in metal cleaning and metal working.

Lehigh Gives Stoughton Honorary Engineering Degree

Lehigh University, where Bradley Stoughton has served since 1923 as professor of metallurgy and since 1936 as dean of engineering, has conferred upon him the honorary degree of doctor of engineering.



Bradley Stoughton

Professor Stoughton is a past president of the American Society for Metals; a past president of the Electrochemical Society, whose Grasselli Medal he was awarded in 1929; and a past secretary of the American Institute of Mining and Metallurgical Engineers. In addition to teaching posts at M.I.T. and Columbia University, he held various industrial positions before coming to Lehigh.

As chief of the Heat Treating Equipment Unit, Tools Section, War Production Board, Bradley Stoughton has rendered invaluable service to the war effort. However, the accomplishment of which he is probably most proud is his report to President Harding in 1922 which was largely instrumental in reducing the steel industry's 12-hour day to eight hours.

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A.S.M. Review of Current Metal Literature—*Continued*

14. FOUNDRY PRACTICE (*Cont.*)

14-323. **Cupola Practice.** Donald J. Reese. *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, pp. 31-33, 44-45.

The general rules given offer a very sound guide for modification of practices that are not entirely satisfactory; lists the points where trouble may arise and the most logical steps towards correction. 6 ref.

14-324. **Quality Control in the Foundry.** E. W. Harding. *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, pp. 37-40.

General principles and experience in high duty iron production.

14-325. **Something You Can Count On.** M. M. Hennessy. *Die Casting*, v. 2, Sept. '44, pp. 40-44.

Small quantity production made economically possible by the development of a group of master die designs. By means of interchangeable slides housings for a number of different counters are produced with minimum die costs.

14-326. **Continuous Development.** John Morse. *Die Casting*, v. 2, Sept. '44, pp. 32-35, 37.

Quantity requirements met by conversion to die castings which made mass production methods possible with a consequent marked reduction in machining time.

14-327. **Wartime Calls on Women to Make Aluminum Air-Cooled Cylinder Heads.** M. J. Gregory. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 16-48.

Foundry designed to use women; development of practices and design; evolution of the new foundry; variations of new procedure; gating considerations; sand handling; dry sands before storing; sand mixing; sand preparation and properties; making body cores; making small cores; core assembling; properties of alloy used; gating practice; melting department; melting practice; pouring practice; control of metal; remelting practice; cleaning; heat treating department; heat treating practice; final operations.

14-328. **The Mechanized Production of Aluminum Gravity Die Castings.** John Vickers. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 49-112.

Advantages of gravity die casting: Smoother finish and closer dimensional accuracy; greater possible speed of production; conservation of raw material; reduction of production scrap; improved mechanical properties in the casting.

14-329. **Factors Involved in Superheating Gray Cast Iron and Their Effects on Its Structure and Properties.** A. Wm. Schneble and John Chipman. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 113-172.

Effects of superheating on the properties of gray cast iron depend upon closely related variables which also influence the structure. Discrepancies in the literature on superheating effects are ascribed to failure to take these other factors into account. Superheating in vacuum or in dry nitrogen is substantially without effect except the indirect effect of a shift in composition. Data are interpreted as showing that superheating effects are not to be attributed to destruction of residual nuclei. Results are also out of harmony with theories of nucleation by non-metallic particles. It is concluded that the presence of carbon monoxide is the chief factor operating to produce the effects of superheating.

14-330. **Lost-Wax Art Finds Its Niche.** *Modern Industry*, v. 8, Sept. 15, '44, pp. 47, 133-134, 136, 139-140.

Precision casting is the only production forming method, applicable to all metals, that insures high accuracy and, at the same time, permits extreme intricacy of design. The only large-quantity process that can be used for tough, high-melting alloys like tool steel. The surface finish it produces is as good as that of die casting, and it's not limited in choice of materials, except for a few like tungsten carbide. Mechanical properties are good.

14-331. **The Manufacture of Converter Steel for Castings: I.** A. W. Gregg. *Industrial Heating*, v. 11, Sept. '44, pp. 1455-1456, 1458, 1460, 1462, 1464.

The details of construction and operation of the side-blow converter used in the manufacture of steel for castings, layout of typical plants designed for such manufacture, and the technical and metallurgical factors entering into the use in foundries of the blowing technique.

14-332. **Casting Iron Centrifugally.** A. E. Falk. *Western Metals*, v. 2, Sept. '44, pp. 9-12.

True centrifugal castings; pouring skill; spinning speeds; mold cooling; lengthening mold life; "fire checking"; pressure gradient.

14-333. **Cupola Raw Materials.** H. W. Gillett. American Foundrymen's Association *Transactions*, v. 52, Sept. '44, pp. 1-15.

Cupola compared with other melting furnaces; heredity fades in steel manufacture; small amounts of elements influence properties and cast iron behavior; heredity in cast iron; variations in behavior of cupola melted cast iron; the graphite nuclei theory; hydrogen and humidity as factors; behavior of coke; tests for coke properties; material scrap; small briquetting devices needed; coke as a chip-bonding agent; experimental run with coke-bonded briquet; substitute briquets for pigs?; coke-bonded briquets; cupola fluxes.

14-334. **Planning Magnesium Casting.** Oscar Blohm and M. D. King. *Light Metal Age*, v. 2, Sept. '44, pp. 20-23.

Correct planning of a new production magnesium casting the difference between success and failure. Tried and proven program suggested by two well known magnesium operators.

15. SECONDARY METALS

15-24. **Reclamation of Automotive Valves.** Norman Hoertz. *SAE Journal*, v. 52, Sept. '44, pp. 430-435.

Ways and means of repairing valves.

15-25. **Briquetting "Swarf" at Warner and Swasey.** G. W. Birdsall. *Steel*, v. 115, Sept. 18, '44, pp. 112-114, 178, 180.

All types of machine cuttings are returned to use by effective system. Briquettes of cast iron "borings" are used by plant foundry. Steel and other metals briquetted when market warrants.

15-26. **Routine Inspection and Salvage of Machinery Weldments.** James W. Owens. American Welding Society Preprint, Oct. '44.

Inspection and salvage of "Customer Inspected" and "Non-Customer Inspected" weldments in an organization having shops for the machining of weldments fabricated in its own welderies and by its own subcontracters.

15-27. **Magnetic Separation.** John E. Hyler. *Steel*, v. 115, Sept. 25, '44, pp. 95-96, 134.

Principles applied to many industrial processes, from segregation of scrap to removal of metal particles from oil lines.

16. FURNACES AND FUELS

16-114. **Recent Developments in Industrial Furnaces.** H. C. Hottel. *Iron Age*, v. 154, August 31, '44, pp. 30-32.

Fundamental concepts of heat transfer, energy balance, physical chemistry and materials of construction.

16-115. **The Fuel Systems at Great Lakes Steel Corporation.** F. C. Frye. *Iron & Steel Engineer*, v. 21, August '44, pp. 78-82.

With oil as the principal fuel, mixed blast furnace and coke oven gas is automatically added to the open hearth furnaces as the supply exceeds other needs.

16-116. **Ideal Postwar Enamel Plant for Cast Iron. II.** Fred M. Burt. *Ceramic Industry*, v. 43, Sept. '44, pp. 58-60.

New type furnaces described and automatic process recommended.

16-117. **New Ways and Means of Compressing and Heating Blast Air in Iron Works.** *Brown Boveri Review*, v. 30, Nov.-Dec. '43, pp. 368-375.

Special advantages obtained through combination of blast compression and heating and by employing a gas turbine to drive the blast blower.

16-118. **Underfeed Stokers for Metallurgical Heating Furnaces.** *Foundry Trade Journal*, v. 73, August 3, '44, p. 279.

Advantages and limitations; limitations of stokers; automatic control.

16-119. **Recent Developments in Industrial Furnaces.** H. C. Hottel. *Mechanical Engineering*, v. 66, Sept. '44, pp. 609-610.

Heat transfer; energy balance; mechanics; materials of construction; chemical process control; combustion.

16-120. **Slag-Metal-Oxygen Relationships in the Basic Open-Hearth and Electric Processes.** J. S. Marsh. American Institute of Mining and Metallurgical Engineers Preprint, Oct. '44, 11 pp.

Carbon-oxygen equilibrium; carbon-oxygen reaction; behavior of oxygen in the basic electric furnace. 8 ref.

16-121. **Energy Balance of Electric Arc Furnaces. VI.** Victor Paschkis. *Industrial Heating*, v. 11, Sept. '44, pp. 1430, 1432, 1434, 1436, 1438, 1440.

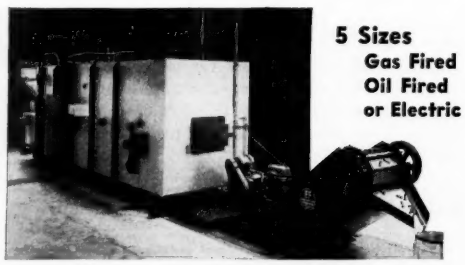
Traditional balances discussed and analyzed. Electric losses are in part dependent (on heat losses) and in part proportional (to the useful load). Raises the question which, if any, type of losses should be preferred in order to obtain best overall efficiency. 5 ref.

16-122. **Factors Affecting Transfer of Heat from Flame to Bath in Open Hearth Furnaces.** *Industrial Heating*, v. 11, Sept. '44, pp. 1466, 1468, 1470.

Methods of obtaining a rapid and high percentage of heat transfer from flame to bath in open-hearth furnaces.

16-123. **Accepting a Challenge.** David McAllen Henderson. *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1071-1075, 1104.

Demand for close dimensional requirements and unblemished surface on bar products requires understanding of effect of furnace atmosphere upon such requirements. Essential that billets and slabs be heated to rolling temperature and the heating be performed with an atmosphere in the furnace which will give a finished product which meets all requirements. Scaling action; decarburizing action; rate of heating; conductivity; soaking.



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16-124. **Some Trends in Coke Oven Design.** D. T. Barritt and R. J. Barritt. *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1080-1086.

New designs and ideas to illustrate the probable lines of post-war development and to show that, in spite of present-day restrictions, coke-oven designers are searching for better methods. Accurate control; length of flame.

16-125. **The Heating of Open-Hearth Furnaces with Mixed Coke-Oven and Blast Furnace Gas. III.** R. W. Evans. *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1087-1089.

Port cooling; port velocity and slope; artificial luminosity; air requirements.

17. REFRACTORIES AND FURNACE MATERIALS

17-48. **Insulation of Steel Plant Equipment.** J. H. Chesters. *Iron Age*, v. 154, August 31, '44, pp. 47-52, 90.

Insulating cements, concrete and coatings discussed. Explanation of the meaning of thermal conductivity and the factors influencing it are given as well as methods for its computation. 101 ref.

17-49. **Pure Oxide Refractories.** D. Kirby. *Metallurgia*, v. 30, June '44, pp. 65-69.

Various kinds of pure oxide refractories discussed and particulars given of their applications and properties.

17-50. **Beryllium Oxide.** L. David. *Metallurgia*, v. 30, June '44, pp. 91-93.

Use and properties discussed briefly; mesh size; production of crucibles and accessory parts. 14 ref.

17-51. **Basic Lined Cupola.** *Foundry*, v. 72, Sept. '44, pp. 118, 121, 124, 126.

Improvements in basic refractories and development of a basic patching material.

17-52. **Gas-Fired Furnaces.** *Iron and Steel*, v. 17, July '44, p. 546.

Permeable refractories eliminate flues and increase thermal efficiency.

17-53. **Properties of Enamel Slips: I, General Properties of Clays and Enamel Slips.** Burnham W. King, Herbert D. Carter, and Harry C. Draker. American Ceramic Society *Journal*, v. 27, Sept. 1, '44, pp. 253-260.

Five clays used to suspend porcelain enamels and their properties were studied.

17-54. **Substitution of Topaz, Domestic Kyanite, and Synthetic Mullite-Corundum for India Kyanite. IV, Raw Topaz as High-Temperature Bond for Domestic Kyanite.** T. N. McVay, W. W. Galbreath, and Dan Allen. American Ceramic Society *Journal*, v. 27, Sept. 1, '44, pp. 275-282.

Raw topaz has been found to act as a high-temperature bond for both raw and calcined kyanite. It is thought that this bonding action is due in part to volatiles which emerge from the raw topaz between 1000° and 1200° C. Some of the topaz decomposition products are absorbed and retained by the calcined kyanite.

17-55. **Permeable Refractories for Gas Fired Furnaces.** *Iron Age*, v. 154, Sept. 7, '44, pp. 72, 154, 156, 158.

The use of permeable refractories through which furnace gases are withdrawn from the furnace chamber.

17-56. **Recent Advancements in Industrial Heating Processes and Equipment. III.** *Industrial Heating*, v. 11, Sept. '44, pp. 1420, 1422, 1424, 1426, 1428, 1450.

The rate of heat absorption by steel in normal furnace operation, an ingenious proportional-mixer-type kiln, carbo-nitriding and improvements in the high-temperature heat treatment of ferrous metals by high-frequency induction.

17-57. **Industrial Survey of Refractory Service Conditions in Electric Steel Furnaces. IV.** *Industrial Heating*, v. 11, Sept. '44, pp. 1500, 1502, 1504, 1506, 1508, 1510, 1512.

The design and operation of electric steel-making furnaces, with especial reference to the effect of these factors on the service life of refractories employed in their construction.

17-58. **Value of Tests on Refractories.** Stuart M. Phelps. American Ceramic Society *Bulletin*, v. 23, Sept. 15, '44, pp. 310-315.

Significance of test data on refractories as related to the manufacture and use of the product discussed. Mention is made of the precautions which should be observed in obtaining samples, conducting tests, and the interpretation of the data. The way in which reliable test results can be used in product control and development by the manufacturer is brought out.

17-59. **Testing Refractories from the Standpoint of Research.** Fred A. Harvey. American Ceramic Society *Bulletin*, v. 23, Sept. 15, '44, pp. 315-317.

Development of new products depends upon the development of testing methods. 7 ref.

17-60. **Significance of Steel-Plant Refractories Testing Program.** W. S. Debenham. American Ceramic Society *Bulletin*, v. 23, Sept. 15, '44, pp. 317-320.

Activities and aims of a steel-plant refractories testing program and of the several factors that either favorably or adversely affect the significance of such work. Knowledge of service conditions and the necessity for their correlation with laboratory tests is stressed, and the suitability of some standard tests discussed.

18. HEAT TREATMENT

18-179. **A Microstructural Guide to the Heat Treatment of a Plain Carbon Steel.** R. J. Raudebaugh and W. E. Fontaine. *Metals & Alloys*, v. 20, August '44, pp. 359-364.

A means of metallographically controlling heat treatment, and also for selecting the best heat treating practice to produce a specific, desired microstructure.

18-180. **Heat Treatment Develops Best Cutting Properties.** M. Martellotti. *American Machinist*, v. 88, August 31, '44, pp. 97-100.

Understanding of the various methods of heat treatment and what goes on inside the metal during the process to secure optimum performance.

Metal Literature Review—*Continued*

18. HEAT TREATMENT (*cont.*)

18-181. Heat Treatment of Light Metals. O. P. Einerl and F. Neurath. *Chemical Age*, v. 51, July 1, '44, pp. 11-16.

Improvement of mechanical properties. Maximum hardening; behavior of super-saturated solutions. 36 ref.

18-182. How to Avoid Heat-Treat Distortion by Die Quenching. G. W. Birdsall. *Steel*, v. 115, August 28, '44, pp. 84-86, 88, 90, 92, 94.

Distortion now held within extremely close limits by special equipment designed to correct warpage from heating and to prevent "out-of-shape" from cooling by holding distribution of temperature gradients throughout work under strict control. Advantages so gained include need for less stock and less work in finish machining, increased output, lowered production costs and better control of heat treating cycles with resultant higher quality of parts.

18-183. Control of Heat Treatment. A. H. Koch. *Steel Processing*, v. 30, August '44, pp. 507-510.

Time and temperature control, types of furnaces.

18-184. A Formulation of the Carburizing Process. Floyd E. Harris and Wilson T. Groves. *Metal Progress*, v. 46, Sept. '44, pp. 488-496.

A generalized formulation of the carburizing and decarburizing processes is made mathematically, and the predicted results then check satisfactorily against a series of experimental determinations.

18-185. Rates of Tempering in Cobalt Steels. Edward A. Loria. American Society for Metals 1944 Preprint No. 4, 8 pp.

Effect of cobalt on the tempering characteristics of carbon-cobalt steels studied by means of hardness measurements. Changes during the tempering of such steels are shown to be similar in nature to those of a plain carbon steel. The cobalt promotes a small increase in hardness following tempering due to its solid solution hardening of ferrite. 6 ref.

18-186. Isothermal Transformation and End-Quench Hardenability of Some NE Steels. R. L. Rickett, J. G. Cutton, C. B. Bernhart, and J. R. Millikin. American Society for Metals 1944 Preprint No. 5, 22 pp.

Isothermal transformation diagram determined for each of the following NE steels: 8620, 8744 (8642), 8949, 9420, 9442, 9540, 9642 and 9650; and for comparison the end-quench hardenability of these or similar steels was measured. Microstructure of these NE steels when isothermally transformed resembles that of some S.A.E. alloy steels. The isothermal transformation diagram furnishes much more information than the end-quench curve, but the latter is a more precise measure of hardenability.

18-187. Air Hardenability of Steels. C. B. Post, M. C. Fetzer and W. H. Fenstermacher. American Society for Metals 1944 Preprint No. 17, 24 pp.

Center cooling velocity of regular shapes during air hardening is shown to be controlled by the area per unit volume (A/V) relationship and is independent of treating temperature. Gradient air hardenability test is described. Hardenability of several air hardening steels presented.

18-188. Experiments on Sodium Cyaniding of High Speed Steel Prior to Hardening. John McIntyre. American Society for Metals 1944 Preprint No. 29, 12 pp.

Experimental work on the cyaniding of three types of high speed steel prior to hardening. Hardness values of Rockwell C-68 to 70 have been obtained throughout sections of 1 in. diameter. Photomicrographs illustrating the structures obtained in the experimental pieces are included and show a marked difference from structures obtained by hard casing procedures.

18-189. Practical Aspects of the Selection of Frequency and Time Cycles for the Processing of Metallic Parts with Induction Heating. W. E. Benninghoff and H. B. Osborn. American Society for Metals 1944 Preprint No. 30, 27 pp.

More general usage of induction heating requires a knowledge of the various inherent characteristics and behavior of high frequency energy. Frequency, time cycles and inductor design and their relationship to the shape and dimensions of the part being treated are important. Practical approach to the application of such knowledge. 5 ref.

18-190. Induction Hardening of Plain Carbon Steels: A Study of the Effect of Temperature, Composition, and Prior Structure on the Hardness and Structure After Hardening. D. L. Martin and Florence E. Wiley. American Society for Metals 1944 Preprint No. 31, 46 pp.

Effect of temperature, composition and prior structure upon the induction hardening characteristics of plain carbon steel; maximum heating temperature is the important variable in induction hardening. To obtain satisfactory properties, it is necessary to heat the steel to a high temperature where diffusion of carbon is rapid. 39 ref.

18-191. Annealing Studies on Cold Rolled Iron and Iron Binary Alloys. Charles R. Austin, Louis A. Luini, R. W. Lindsay. American Society for Metals Preprint No. 40, 35 pp.

Response of iron binary alloys to strain hardening by cold rolling and the behavior of the cold-rolled alloys during annealing. Data are for the alloys of iron with nickel, chromium, cobalt, silicon, manganese and molybdenum. These alloys were reduced in thickness by 5, 20, 40, 75 and 90% and the cold-rolled alloys were annealed subsequently at temperatures ranging from 625 to 1400°. Comparison studies were made on unalloyed iron in all instances.

18-192. Low Frequency Induction Heating. O. Kreisel. *Welding Journal*, v. 23, August '44, pp. 710-712.

Practical application for preheating and normalizing in connection with welding and other heating development.

18-193. Cast Structures. H. T. Angus. *Iron and Steel*, v. 17, July '44, pp. 537-540.

Modification of steels by heat treatment.

18-194. Bright Hardening. C. E. Peck. *Iron and Steel*, v. 17, July '44, pp. 555-558.

Developments and applications of controlled atmospheres.

18-195. The Effect of Quenching and Prolonged Tempering on the Structures of α-Base Tin-Antimony-Cadmium Alloys. With An Addendum on the Experimental Control of Temper-Hardening in These Alloys. W. T. Pell-Walpole. Institute of Metals *Journal*, v. 70, July '44, pp. 339-348.

The microstructures of 80 alloys have been examined after the following treatments: (1) Annealed to equilibrium at 150° C.; (2) quenched from the maximum practicable annealing temperature; (3) as (2), then tempered at 150° C. for 8, 16, 32, 70, 150, 500, and 1000 hrs. Typical microstructures showing changes in structure produced by tempering are given. Changes in structure are correlated with changes in mechanical properties. Temper-hardening accompanies fine acicular precipitation of the δ phase, while stability during prolonged tempering depends upon the degree to which this precipitation coalesces. Intergranular embrittlement caused by tempering certain alloys is shown to be caused by precipitation of films of ε phase on the grain boundaries. 4 ref.

18-196. The Control of Composition and Heat-Treatment in 0.25 C 1.5 Mn Steel Castings. T. W. Ruffle. *Foundry Trade Journal*, v. 73, July 13, '44, pp. 215-220.

Data of use and interest to steel founders who have had no previous experience with this type of steel. Composition; heat treatment—normalizing; heats outside composition limits; water quenching and tempering; quenching; tempering temperature; time of tempering; temper brittleness; Tropenas converter steel.

18-197. High-Frequency Heating. A. G. Robiette. *Metal Treatment*, v. 11, Summer '44, pp. 83-90.

Fundamental principles, the metallurgical effects and the economics of high frequency heating. Indicates some of its immense possibilities.

18-198. Heat Treating Broaches. William L. Gibbons. *Steel*, v. 115, Sept. 11, '44, pp. 106, 108, 110, 166.

Routine for hardening broaches is undergoing many progressive changes in step with widened use of the broach for high speed cutting of extremely hard metals. Range of equipment insures flexibility to meet changes.

18-199. Nitriding the Austenitic Steels Improves Wear Resistance. I. A. Binder. *American Machinist*, v. 88, Sept. 14, '44 pp. 102-104.

A case depth of only 0.004 to 0.005 in. is secured when nitriding the heat resisting steels, but this treatment gives these materials a longer life if subject to friction.

18-200. Nitriding Hardened High-Speed Steel Tools. J. G. Morrison. *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, pp. 28-30, 46-47.

Performance of high speed steel cutting tools greatly improved by various surface-altering procedures. Methods employed are chromium plating, liquid nitrating, surface oxidation, and surface oxidation imposed on a nitriding surface. This paper deals primarily with nitriding, and gives a comparison of the several methods.

18-201. Hydraulic System Components. G. Eldridge Stedman. *Steel*, v. 115, Sept. 18, '44, pp. 108-109, 144, 146, 148, 151-152.

West Coast plant employs improved methods in heat treating.

18-202. The Principles and Practice of Lithium Heat Treating Atmospheres. I. Charles E. Thomas. *Industrial Heating*, v. 11, Sept. '44, pp. 1405-1406, 1408, 1410, 1412, 1414, 1416.

Summarizes the various steps connected with the development of the use of lithium metallic vapor in atmospheres in the heating chambers of industrial furnaces for the prevention of scaling and decarburization, in the carburizing medium employed in gas carburizing, for descaling, and for restoration of carbon to decarburized steel.

18-203. The Heatreat Company Specializes in Mass Production Heat Treatment of Large Runs. *Industrial Heating*, v. 11, Sept. '44, pp. 1518, 1520, 1522.

Box-type general-purpose furnaces; tool-room type furnaces; electric salt bath furnace; pot-type salt bath furnaces; tempering equipment; instrumentation; quenching facilities; testing and inspection.

18-204. Leaf Spring Production. John Ade. *Steel*, v. 115, Sept. 25, '44, pp. 80-81, 136, 138.

Close control over heat treatment forces designer to stay close to physical limits of material used. Procedure used by Standard Steel Spring Co. described.

19. WORKING

Rolling, Drawing, Pressing, Forging

19-235. Bending and Forming Heavy Steel Sections Hydraulically. C. W. Hinman. *Steel Processing*, v. 30, August '44, pp. 490-492.

Hydraulic arbor press operations; bending structural steel sections; description of die; using V-dies in hydraulic presses.

19-236. Shell Forging. II. M. D. Stone. *Steel Processing*, v. 30, August '44, pp. 493-497, 503.

Roller-type dies adopted; "upsetter" method of shell forging; forging shells by "one-shot" process; "nosing" operation; cold nosing.

19-237. Heavy Stampings—Increasingly Incorporated in Equipment of all Kinds. *Steel Processing*, v. 30, August '44, pp. 498-500.

Stampings no longer confined to small items of thin metals. Many plants in the pressed metal field are making provisions for equipment that will enable them to handle heavy stampings.

19-238. Light Alloy Extruded Sections. W. Bleicher and G. W. Berger. *Luftwissen*, v. 10, no. 1, Jan. '43, pp. 23-27. *Engineers' Digest*, v. 1, August '44, pp. 499-501.

Extrusion billet, preheated to a suitable temperature, is pressed through an aperture in a die, whereby it obtains the required section shape. A great diversity of cross-sectional shapes is obtainable by this method.

19-239. Safety Devices on Presses and Stamping Machines. *Mecanique, Paris*, no. 315, July '43, pp. 235-236. *Engineers' Digest*, v. 1, August '44, pp. 512-513.

Devices to protect the fingers of the worker.

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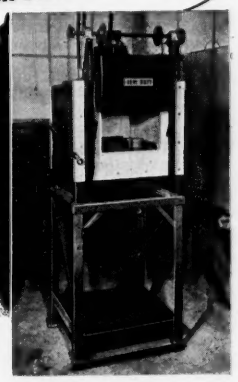

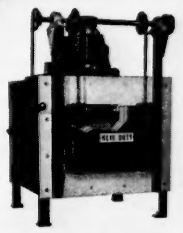

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Metal Literature Review

19. WORKING (*cont.*)

19-240. A 388-Punch Press Tool. *Machinery* (London), v. 64, June 29, '44, pp. 714-716.

Designed for punching catwalks for the flying fortress.

19-241. The Rolling of Semi-Finished Steel. Ross E. Beynon. *Iron & Steel Engineer*, v. 21, August '44, pp. 37-54.

Methods and problems in rolling semi-finished steel. Work still to be done in improving product and reducing costs.

19-242. Many Deep Drawing Problems Solved Successfully in Setting Up Steel Cartridge and Shell Case Program. Harold R. Turner. *Steel*, v. 115, Sept. 4, '44, pp. 82-83, 114, 116, 118, 120, 122, 126, 128, 130, 132, 134.

Report on the problems involved and the manufacturing methods employed in producing steel cartridge and shell cases for the Army. Navy is continuing its program and heat treated carbon steel cases for 40-mm. shells are being produced monthly by the millions.

19-243. The Extrusion of a Brass Cup. G. Sachs, J. Ogden, and F. J. Miller. *Modern Industrial Press*, v. 6, August-Sept. '44, p. 24.

Laws of plastic working makes it possible to fabricate complicated parts by press forming frequently more economically than by machining, casting, welding, or brazing.

19-244. Recent Developments in Stretch Forming of Aircraft Parts. II. Harry Wilkin Perry. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 26, 28, 56.

Equipment consists of a 300-ton Erco skin-stretch press, a Sheridan skin-stretch press, a Hufford extrusion-stretching machine, an 800-ton double-acting press, and a number of miscellaneous stretching fixtures.

19-245. Cold-Drawn Steel Cartridge Cases at Norris Stamping & Manufacturing Co. II. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 35-38.

Cold-drawn steel casing fired without malfunctioning.

19-246. Combination Forming and Shearing Dies for Master Rubber Pad. Gordon B. Ashmead. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 41-42, 44, 46.

Aircraft design revolutionized with the help of the Guerin process.

19-247. Forging Naval Shells by the Pierce and Draw Method. *Iron Age*, v. 154, Sept. 7, '44, p. 67.

Production advantages resulting from the adaptation of the pierce and draw method of forging large caliber projectiles for the U. S. Navy.

19-248. A Survey of Wrought Magnesium Alloy Fabrication. J. V. Winkler. American Society for Metals. 1944 Preprint No. 8, 55 pp.

Latest developments for the fabrication of wrought magnesium alloys. A detailed discussion of methods employed in a fabricating shop for shaping magnesium alloy parts, and methods of joining component parts in fabricating a magnesium alloy structure.

19-249. Aluminum Alloy Forging Materials and Design. L. W. Davis. American Society for Metals 1944 Preprint No. 21, 25 pp.

Alloys available for forgings are enumerated and the advantages of each are indicated. A method of determining relative forgeability described. The method permits evaluation of new forging materials and accurate comparison with other alloys. New forging equipment has been developed especially to handle aluminum alloys. A description of a hydraulic forging press, a forging roll and other equipment given.

19-250. A Variable Reciprocating Motion. L. K. *Machinery* (London), v. 65, July 13, '44, pp. 41-42.

Reciprocating mechanism used on a wire-fabricating machine to convert a uniform motion into a variable motion.

19-251. Design of Dies for Producing Printing-Press Gripper Pads. H. E. M. *Machinery* (London), v. 65, August 3, '44, pp. 131-132.

The blanking, piercing, and forming operations required to produce this piece could be performed most efficiently and economically by employing two dies of the simple design illustrated.

19-252. Special Systems of Regulation for Continuous Mills in Steel Works. *Brown Boveri Review*, v. 30, Nov.-Dec. '43, pp. 324-327.

Various methods of operation of rolling mills; gives details of the system of regulation best suited to each individual case.

19-253. Spar Flanges and other Extrusions in Various Enemy Aircraft. *Metallurgia*, v. 30, July '44, pp. 163-164.

Data obtained as a result of a metallurgical examination of spar flanges and other extruded sections taken from enemy aircraft summarized.

19-254. Heel Nails and Wire Screen. A. G. Arend. *Machinery* (London), v. 65, August 3, '44, pp. 128-130.

Simultaneous production from the same strip.

19-255. Tubes with Reduced Ends for Light Tubular Structures. Arthur Z. Bendar. *Product Engineering*, v. 15, Sept. '44, pp. 635-637.

Improved methods of reducing the diameter of round tube ends permit more efficient applications of tubing to structural subassemblies. Proper design illustrated and common reducing and swaging methods compared.

19-256. Flange Rolling Improves Quality, Speeds Output. *Aviation*, v. 43, Sept. '44, pp. 146-147, 249.

A flange rolling machine, using backing and forming rolls and heating unit for making flanged bushings.

19-257. Designing Rubber Press Tools. J. Albin. *Iron Age*, v. 154, Sept. 14, '44, pp. 50-57.

Accurate forming of sheet metal in the hydropress accomplished if consideration is given to the dual action of the frictional and fluid properties of the rubber when under compression. Based on this analysis of rubber pad action, design standards established together with the development of unusual form blocks and other rubber press tools. Elimination of hand finishing is illustrated by novel uses of dams, undercuts, punches and other tool elements.

Addresses of Publications

Annotated in A.S.M. Review of Current Metal Literature

Aero Digest, 515 Madison Ave., New York
Aeronautical Engineering Review, 1505 RCA Bldg., 30 Rockefeller Plaza, New York
Aircraft Engineering, 12 Bloomsbury Sq., London, W.C.1, England
Aircraft Production, Stamford St., London, S.E.1, England
Alloy Casting Bulletin, 39 Broadway, New York
Alloy Metals Review, Ditton Road, Widnes, Lancashire, England
Aluminum and the Non-Ferrous Review, 26 Ludgate Hills, London, E.C.4, England
American Ceramic Society Journal, 2525 N. High St., Columbus, Ohio
American Electroplater's Society Monthly Review (See *Monthly Review*)
American Foundryman, 222 West Adams St., Chicago, Ill.
American Foundrymen's Association Transactions, 222 West Adams St., Chicago, Ill.
American Iron & Steel Institute Yearbook, 350 5th Ave., New York
American Machinist, 330 W. 42nd St., New York
American Railway Engineers Association Bulletin, 59 E. Van Buren, Chicago 5, Ill.
American Society for Metals Transactions, 7301 Euclid Ave., Cleveland 3, Ohio
American Society for Testing Materials Bulletin, 260 S. Broad St., Philadelphia, Pa.
American Society for Testing Materials Proceedings, 260 S. Broad St., Philadelphia, Pa.
American Society of Mechanical Engineers Journal, 29 W. 39th St., New York
American Society of Mechanical Engineers Transactions, 29 W. 39th St., New York
American Society of Naval Engineers Journal, Navy Bldg., Washington, D. C.
American Welding Society, 33 W. 39th St., New York
Architectural Forum, Time & Life Bldg., Rockefeller Center, New York
Architectural Record, 34 N. Crystal St., E. Stroudsburg, Pa.
Archiv Fur Eisenhuttenwesen, Breite Str. 27, Dusseldorf, Germany
Army Ordnance, Suite 705, Mills Bldg., Washington, D. C.
Australasian Institute of Mining and Metallurgy Proceedings, 376-380 Collins St., Melbourne, Australia
Automotive & Aviation Industries, Chestnut and 56th St., Philadelphia, Pa.
Aviation, 330 W. 42nd St., New York

Bell Laboratories Record, 463 West St., New York
Bell System Technical Journal, 195 Broadway, New York
Blast Furnace & Steel Plant, Thaw Bldg., Pittsburgh, Pa.
Brick and Clay Record, 59 E. Van Buren St., Chicago, Ill.
British Cast Iron Research Association Bulletin, Alvechurch, Birmingham, England.
British Non-Ferrous Metals Research Association Bulletin, Euston St., London, N.W.1, England
Brown Boveri Review, 19 Rector St., New York
Business Week, 330 West 42nd St., New York

Canadian Chemistry and Process Industries, 137 Wellington St., W. Toronto 2, Canada
Canadian Metals & Metallurgical Industries, 137 Wellington St., W. Toronto 2, Canada
Canadian Mining & Metallurgical Bulletin, Drummond Bldg., Montreal, Canada
Ceramic Industry, 59 E. Van Buren St., Chicago, Ill.
Chemical Age, 154 Fleet St., London, E.C.4, England
Chemical & Engineering News, 20th & Northampton Streets, Easton, Pa.
Chemical & Metallurgical Engineering News, 330 W. 42nd St., New York
Chemical Industries, 522 Fifth Ave., New York
Compressed Air Magazine, 11 Broadway, New York 4, N. Y.

Die Casting, 812 Huron Rd., Cleveland, Ohio
Diesel Progress, 2 West 45th St., New York 19, N. Y.
Domestic Commerce, Superintendent of Documents, Government Printing Office, Washington 25, D. C.

Electric Light & Power, 360 North Michigan Ave., Chicago, Ill.
Electrical Manufacturing, 1250 6th Ave., New York
Electronic Engineering, 43 Shoe Lane, London, E.C.4, England
Electronic Industries, 480 Lexington Ave., New York
Electronics, 330 W. 42nd St., New York
Electrochemical Society Transactions, 3000 Broadway, New York 27, N. Y.
Electrodepositors' Technical Society Journal, St. John St., Clerkenwell, London, E. C. 1, England
Engineer, 28 Essex St., Strand, London, W.C.2, England
Engineering, 35-36 Bedford St., Strand, London, W.C.2, England
Engineering & Mining Journal, 330 W. 42nd St., New York
Engineering Inspection, 2 Caxton St., Westminister, S.W.1, England
Engineers' Digest, 120 Wigmore St., London, W.1, England

Factory Management and Maintenance, 330 W. 42nd St., New York
Finish, 360 N. Michigan Ave., Chicago 1, Ill.
Fortune, 350 E. 22nd St., Chicago, Ill.
Foundry, Penton Bldg., Cleveland, Ohio
Foundry Trade Journal, 49 Wellington St., Strand, London, W.C.2, England

General Electric Review, Schenectady, New York
Giesserei, Dusseldörf, Germany

Hardware Age, 100 East 42nd St., New York 17, N. Y.
Heating and Ventilating, 148 Lafayette St., New York

Industrial Chemist, 33 Tothill St., London, S.W.1, England
Industrial & Engineering Chemistry, Easton, Pa.
Industrial Finishing, 1142 N. Meridian St., Indianapolis, Ind.
Industrial Gas, 56th and Chestnut St., Philadelphia, Pa.
Industrial Heating, Union Trust Bldg., Pittsburgh, Pa.
Industrial Radiography, 25 East Washington St., Chicago, Ill.
Industry & Power, St. Joseph, Mich.
Industry & Welding, Industrial Publishing Co., 812 Huron Rd., Cleveland 15, Ohio
Institute of Metals Journal, 4 Grosvener Gardens, London, S.W.1, England
Institute of Radio Engineers Proceedings, 330 W. 42nd St., New York
Institute of Welding Transactions, 104 Victoria St., London, S.W.1, England
Institution of Automobile Engineers, 12 Hobart Place, London, S.W.1, England
Institution of Mechanical Engineers, Storey's Gate, St. James Park, London, S.W.4, England
Instruments, 1117 Wolfendale St., Pittsburgh, Pa.
Iron Age, 100 E. 42nd St., New York
Iron & Steel, 22 Henrietta St., Covent Garden, London, W.C.2, England
Iron & Steel Engineer, Empire Bldg., Pittsburgh, Pa.
Iron & Steel Institute Journal, 4 Grosvenor Gardens, London, S.W.1, England

Jernkontorets Annaler, Stockholm 16, Sweden
Journal of Aeronautical Sciences, 30 Rockefeller Plaza, 1505 RCA Bldg., New York
Journal of Applied Mechanics, 20th & Northampton Sts., Easton, Pa.
Journal of Applied Physics, 175 Fifth Ave., New York
Journal of Research, National Bureau of Standards, Government Printing Office, Washington, D. C.
Journal of Scientific Instruments, Fetter Lane, London E.C.4, England

Korrosion Und Metallschutz, Berlin, Germany

Light Metal Age, 20 E. Jackson Blvd., Chicago, Ill.
Light Metals, Bowling Green Lane, 5-17 Roseberry Ave., London, E.C.1, England
Lubrication, 135 E. 42nd St., New York City
Luftfahrtforschung, Gluckstr 8, Munich 32, Germany

Machine Design, Penton Bldg., Cleveland, Ohio
Machine Tool Blue Book, 542 S. Dearborn St., Chicago 5, Ill.
Machine Tools, Cleveland Ohio
Machinery (London), 17 Marine Parade, Brighton, England
Machinery, 148 Lafayette St., New York
Machinery Lloyd, 152 Upper New Walk, Leicester, England
Mechanical Engineering, 29 W. 39th St., New York
Metal Finishing, W. 42nd St., New York
Metal Industry, Dorset House, Stamford St., London, S.E.1, England
Metal Progress, 7301 Euclid Ave., Cleveland 3, Ohio
Metal Treatment, 49 Wellington St., Strand, London, W.C.2, England
Metallurgia, 21 Albion St., Gaythorn, Manchester, England
Metals, 150 Lafayette St., New York
Metals & Alloys, 330 W. 42nd St., New York
Metals Technology, 29 W. 39th St., New York
Mill and Factory, 205 E. 42nd St., New York
Mill Supplies, 330 W. 42nd St., New York
Mine and Quarry Engineering, 13-16 Fischer St., Southampton Row, London, W.C.1, England
Mines Magazine, 734 Cooper Bldg., Golden, Colo.
Mining & Metallurgy, 29 W. 39th St., New York
Mining Congress Journal, 309 Munsey Bldg., Washington, D. C.
Mining Journal, 520 Title & Trust Bldg., Phoenix, Ariz.
Mining Technology, 29 W. 39th St., New York
Mining World, 71 Columbia St., Seattle, Wash.
Modern Industrial Press, P. O. Box 687, Pittsburgh, Pa.
Modern Industry, 347 Madison Ave., New York
Modern Machine Shop, 431 Main St., Cincinnati, Ohio
Modern Plastics, 1229 E. 42nd St., New York
Monthly Review, 93 Oak Grove Ave., Springfield, Mass.

New Pencil Points, 330 W. 42nd St., New York 18, N. Y.
Newsweek, 152 W. 42nd St., New York

Optical Society of America Journal, 175 Fifth Ave., New York
Oxy-Acetylene Tips, 30 E. 42nd St., New York 17, N. Y.

Paint Technology, 5 Grange Court, Pinner, Middlesex, England
Pig Iron Rough Notes, Birmingham, Ala.
Printing Equipment, 1276 W. 3rd St., Cleveland, Ohio
Product Engineering, McGraw-Hill Publishing Co., 330 W. 42nd St., New York
Products Finishing, 431 Main St., Cincinnati, Ohio
Purchasing, 205 E. 42nd St., New York 17, N. Y.

Railway Age, 1309 Noble St., Philadelphia, Pa.
Railway Engineering and Maintenance, 30 Church St., New York
Railway Mechanical Engineer, Terminal Tower, Cleveland 13, Ohio
Refractories Journal, 8 Adam St., Adelphi, The Strand, London, England
Reviews of Modern Physics, 175 Fifth Ave., New York

Scientific American, 24 W. 40th St., New York 18, N. Y.
Schweizer Archiv, Solothurn, Switzerland
Sheet Metal Industries, 49 Wellington St., London, W.C.2, England
Skillings' Mining Review, 501 Builders Exchange, Duluth, Minn.
Society of Automotive Engineers Journal, 29 W. 39th St., New York
Society of Chemical Industry (Journal and Transactions), Euston Rd., London, N.W.1, England
Stahl Und Eisen, Dusseldorf, Germany
Steel, Penton Bldg., Cleveland, Ohio
Steel Processing, 108 Smithfield St., Pittsburgh, Pa.

The Miner, 505 Metropolitan Bldg., Vancouver, B. C., Canada
Time, 330 E. 22nd St., Chicago
Tin, 25 Charles St., Haymarket, London, S.W.1, England
Tin & Its Uses, Fraser Rd., Greenford, Middlesex, England
Tool & Die Journal, 289 4th Ave., New York
Tool Engineer, 2842 W. Grand Blvd., Detroit 2, Mich.

Welding, 22 Henrietta St., London, W.C.2, England
Welding Engineer, 506 S. Wabash Ave., Chicago
Welding Journal, 33 W. 39th St., New York
West Scotland Iron & Steel Institute Journal, 93 Hope St., Glasgow, Scotland
Western Machinery & Steel World, 500 Sansome St., San Francisco, Calif.
Western Metals, 1709 W. 8th St., Los Angeles, Calif.
Westinghouse Engineer, East Pittsburgh, Pa.
Wire & Wire Products, 300 Main St., Stamford, Conn.

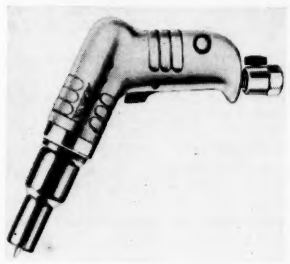
Zeitschrift Fur Metallkunde, VDI Verlag, Berlin, N.W.7, Germany

NEW PRODUCTS IN REVIEW

IMPACT TYPE SCREW DRIVER AND NUT SETTER

The Aro Equipment Corp., Bryan, Ohio.

A new line of impact screw drivers and nut setters with positive torque control features a torque regulator located in the handle, allowing the operator easy regulation of the torque necessary to tighten the screw or nut. There is ample adjustment to meet most screw driving and nut setting conditions.



Pneumatically powered, this tool operates with a roller clutch impact mechanism having only four major parts — anvil, hammer and two cylindrical steel rollers. When in operation, the centrifugal force throws the two steel rollers out against the hammer; this transfers the full torque through to the work in the form of a sudden impact. When the selected torque is obtained, the rollers rebound from the anvil face and do not allow the hammer to engage for impact.

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ZINC STRIPPER

The Enthone Co., 475 Elm St., New Haven, Conn.

Development of an alkaline stripper called "Enthone Zinc Stripper" is announced for the rapid removal of zinc plate. This new product quickly strips zinc plated coatings of all types, and thicknesses of the order of 0.001 in. will strip in 30 sec., leaving the metal clean and bright.

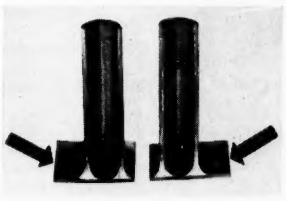
Due to the alkaline nature of the solution, the tendency for rusting of the steel after stripping is largely removed, whereas this is a serious problem when acid strips are used, the company says. The stripper is supplied as salts which are added to water in the concentration range of 2 to 3 lb. per gallon and the mixture heated from 200 to 215° F. Plain steel tanks and heating coils are used.

Mention R554 When Writing or Using Reader Service.

FREE FLOWING SOLDER FOR ALUMINUM

Eutectic Welding Alloys Co.,
40 Worth St., New York 13, N. Y.

Sheet aluminum can now be lock-seamed, or lapped and spot welded or riveted, and the joint sealed with a new free flowing solder, EutecRod 199, it is announced. This is said to be the first free-flowing soft solder for use on aluminum and aluminum alloys. Used with Autochemic Eutector Flux 199, EutecRod 199 will flow on aluminum as readily as lead-tin solder on tin plate, brass or copper.



In long laps, EutecRod 199 will make joints of moderate strength, but it should generally be used as a seal. This rod will work on cast aluminum as well as on wrought aluminum, and on steel, copper and nickel alloys. It is suitable for applications where the completed joint will not be heated over the boiling point of water under working conditions. Its low temperature of application, 400° F., makes it possible to join thin sheet metal without danger of distortion. It will bond to cast iron, if the iron has first been tinned with a zinc base solder.

Mention R555 When Writing or Using Reader Service.

IMPROVEMENT IN CAPACITOR DISCHARGE CONTROLS

Industrial Control Div., General Electric Co.,
Schenectady, N. Y.

A new precise electronic forge-pressure timer has been incorporated in the line of capacity discharge controls for use with stored-energy type resistance welding machines. The new timer, which is designed for dual pressure spot welding machines of the capacitor discharge type, functions to supply accurately timed forge pressure, so that the required welding energy, cracks, indentations, and sheet separation are reduced.

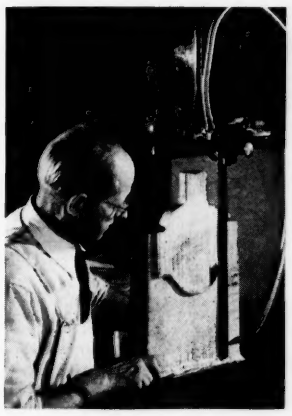
Calibrated in milliseconds, the timer consists of a timing circuit with a regulated d-c source of voltage to assure accurate timing; the necessary electronic tubes; and a time-delay relay with fixed timing for compensating for the delay in the operation of the solenoid valve on the welding machine, so that the forge pressure can be applied precisely at any point during the current discharge.

Mention R556 When Writing or Using Reader Service.

NEW SAW BLADE

The DoAll Co., 254 North Laurel Ave., Des Plaines, Ill.

This saw blade has been scientifically developed to eliminate operator fatigue, speed up production and do away with resharpening and resetting. It is known as the DoAll Buttress Saw. Innovation in design of teeth permits rapid production, parallelism and close tolerance over the entire finished cut. Tooth gullets are elongated to provide plenty of room for fast removal of chips to assure cool, continuous cutting. The teeth are securely anchored to withstand shock, and made fast in their precision set position by means of accurately controlled heat treatment.



High carbon steel of the finest quality is used to impart abrasive resistance to the sharp cutting edge of the teeth. The saw is manufactured in widths from ¼ in. to 1 in., having various sets and pitches. Literature is available.

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NEW TRADE NAME

Quaker Chemical Products Corp., Conshohocken, Pa.

The trade name "Microcut" has been selected by the company for its line of soluble cutting oil bases formerly known as Tool Kool and designated as Tool Kool 1, Tool Kool 20, etc. Numbers such as 1 and 20 will be used as before to designate the various types.

Mention R558 When Writing or Using Reader Service.

WELDALENE, A NEW FLUX

Foote Mineral Co., Summer St., Philadelphia, Pa.

"Weldalene" is a new addition to this company's list of welding fluxes with properties suggesting use in mild steel and stainless rods (a.c. or d.c.). It has unusual sintering characteristics—Weldalene sinters 220° F. before it is vitreous; it deforms 100° F. before it is vitreous. Consequently, it is an active flux over a wide range of temperature, which suggests a means of controlling slag fluidity. Its ratio of alumina to silica is 24 to 60%, indicating that Weldalene—by reacting with free silica—may reduce silica included in weld metal. It contains a substantial percentage of potassium, assuring greater arc stabilization.

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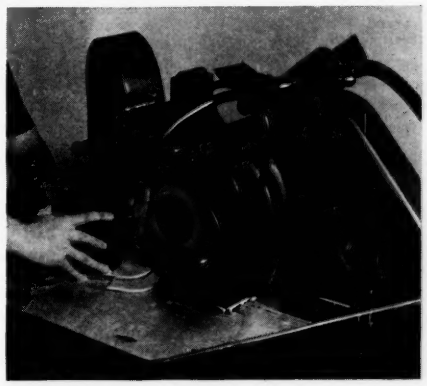
NORTON BURA-WAY GRINDER

Norton Co., Worcester, Mass.



Convinced that wartime shortages have forced onto industry as a whole beneficial practices in the conservation of tools, and firm in the belief that these practices will be continued in peacetime, this company has acquired the Bura-way Grinder as a further extension of its line of tool room grinders and production cylindrical and surface grinders, flat and cylindrical lappers.

This machine brings to industry the growing concept that metal cutting tools should have "constant relief in the direction of feed." The new addition to the Norton line provides a means of forming such relief quickly and easily, duplication being within the capacity of the greenest apprentice. Added factors which will contribute to longer tool life include means of precise control in grinding tool angles, close control of the amount of metal removed in renewing cutting edges, precise reproduction of form tools within close dimensional limits, and the production of a fine surface finish at the tool's edge to give increased production per grind and a clean cut in operation. The unit, now equipped for wet grinding, is equally suited to the rough or finsh grinding of tools, handling high speed and cast chromium-cobalt steels as well as carbide tipped tools.

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A.S.M. Review of Current Metal Literature— *Continued*

19. WORKING (*Cont.*)

19-258. **Coining Heavy Gage Stampings.** Stanley H. Brams. *Iron Age*, v. 154, Sept. 14, '44, pp. 58-60.
Coining of heavy gage stampings is related to cold forging or upsetting. The term implies accurate sizing and work hardening of the material to higher strengths. Some of the possibilities of the process are found in examples taken from practice at the Detroit Stamping Co.

19-259. **What's Ahead in Forging.** *American Machinist*, v. 88, Sept. 14, '44, pp. 91-96.
Forging practice improved in meeting war production demands. The modernization of equipment and enlarged forging capacity will be a big factor in spreading the use of forging to new fields.

19-260. **Seamless Tubes and Spinning Process Result in Superior Bomb Casings.** *American Machinist*, v. 88, Sept. 14, '44, pp. 115-120.
Design and installation.

19-261. **History and Growth of the Tungsten Carbide Die.** A. R. Zapp. *Wire & Wire Products*, v. 19, Sept. '44, pp. 543-546, 569-570, 571.
Development and perfecting of dies. Three classes of industries; sintered-carbide dies; use in America; older types of dies; evolution of basic die shape; die machinery developed; rough-cored dies; reasons for carbide adoption; growth is mutual.

19-262. **Sub-Sieve Diamond Powders for Die Work. II.** Paul L. Hertz. *Wire & Wire Products*, v. 19, Sept. '44, pp. 547-549, 572-574.
Helpful formulae; selection of a liquid; difficulties and how to overcome them. Practical hints.

19-263. **Small Diamond Die Industry Advisory Committee Meeting Brings Out Interesting Facts on Die Situation.** *Wire & Wire Products*, v. 19, Sept. '44, pp. 550-553, 579.
Requirements of dies; supply of dies; increased productivity of dies; technical mission to England; general organization; manufacturing methods; efficiencies of die manufacturers; developments on methods in progress; form and quality of dies; die specifications drawn up; wire drawing; die performance; comments on Dr. Whittaker's report; labor and selective service efficiency rating method; other labor problems; wages; rough diamonds.

19-264. **Ten Recommendations for the Use of Diamond Drawing Dies.** *Wire & Wire Products*, v. 19, Sept. '44, pp. 554, 580-582.
Annealing and pre-treatment; die holder and its treatment; introduction of wire; lubrication and cooling; when to withdraw; spare dies; drawing speed; weight of stone; diamond and sintered carbide dies; handling diamond dies. 3 ref.

19-265. **Designing Rubber Press Tools.** *Iron Age*, v. 154, Sept. 21, '44, pp. 59-66.
Applications of rubber press tools for forming concave, convex and reverse flanges, joggles and some now difficult shapes are described. Certain drawing operations on sheet aluminum hitherto considered beyond the capacity of the hydropress also described.

19-266. **Reynolds Aluminum Fabrication.** Joseph Geschelin. *Automotive Industries*, v. 91, Sept. 15, '44, pp. 38-40, 82, 84, 86.
Service organized on large scale basis and will be offered to postwar trade.

19-267. **The Use of Rubber in Conjunction with Press Tools.** *Machinery*, v. 51, Sept. '44, pp. 172-176.
Effective and economical methods of producing a wide range of sheet-metal parts.

Shaper grips the work in a vise, the cutting tool shuttles back and forth cutting on only one cycle. Each stroke makes one chip until the entire section removed is reduced to a worthless heap.

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slices out the part to within .005 of the layout line, leaving the section removed in a solid, usable piece.

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20. MACHINING AND MACHINE TOOLS

20-323. **Ammunition - Hoist Parts Efficiently Machined.** Gerald Eldridge Stedman. *Metals & Alloys*, v. 20, August '44, pp. 342-345.
Machine tool selection is made a function of the engineering, design and performance requirements of the particular part to be manufactured. The jig and fixture work is ingenious and is responsible for large savings in time and materials.

20-324. **Face Milling.** *Aircraft Production*, v. 6, July '44, p. 333.
Two types of negative rake cutters for high speed work.

20-325. **Hercules Engine Components.** J. A. Oates. *Aircraft Production*, v. 6, July '44, pp. 309-319.
Machining operations on the crankecase, impellor, sleeve, cylinder barrel and connecting rods.

20-326. **Some Aspects of Precision Grinding Practice.** R. Whibley. *Machinery* (London), v. 64, June 29, '44, pp. 709-713.
Methods of removing swarf from coolants; the influence of work diameter to wheel diameter ratio and of internal or external grinding on wheel speed; automatic sizing machine cycle; and grinding machines or attachments for special purposes.

20-327. **Torpedoes Assembled in Machine Setup.** *Iron Age*, v. 154, August 31, '44, pp. 42-46.
To assure precise alinement of the five sections of an 18-in. naval aircraft torpedo, final fitting and assembly is done with the aid of fixtures on a Cutmaster vertical turret lathe. The centerline method is used throughout in the machining operations on the principal components.

20-328. **Difficult Contours Turned With Simple Attachments.** Creighton Taylor. *American Machinist*, v. 88, August 31, '44, pp. 87-88.
Toolroom can make a similar device to convert engine lathes for turning molding dies of intricate, difficult shapes.

20-329. **Special Reamer Eliminates Honing and Polishing.** Charles Wolfe. *American Machinist*, v. 88, August 31, '44, p. 89.
A special carbide-tipped reamer, which provides a finish of between three and five micro-inches.

20-330. **Conveyors Cut Machining Time on Cylinder-Head Assemblies.** *American Machinist*, v. 88, August 31, '44, pp. 90-93.
Conveyors from former auto-engine assembly lines reduce the allotted times for machining and inspection operations on a P&W cylinder-head assembly engine.

20-331. **Naval Torpedo Propellers Machined to Precise Dimensions.** Carl G. Preis. *American Machinist*, v. 88, August 31, '44, pp. 117-120.
Largest torpedo weighs 17 lb. and is machined from a 30-lb. steel forging. Propellers are carefully balanced to minimize vibration when in use.

20-332. **Electronic Control at Ford Motor Co. Enters Field of Drill Press Work.** P. D. Aird. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 17-18, 22.
Torque has been made to activate an electronic circuit with the result that drilling oil holes in an airplane crankcase section has been stepped up and with a resultant decrease in tool damage and part spoilage.

20-333. **Designing of Trouble-Free Dies.** C. W. Hinman. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 20, 22.
Broaching dies and machines. Shallow broaching cuts done in ordinary punch presses and in horizontal and hydraulic presses.

20-334. **Planer Type Milling Machines Built from Sub-Assemblies.** A. Dürr. *Werkstattstechnik der Betrieb*, v. 37/22, no. 6, June '43, pp. 233-237. *Engineers' Digest*, v. 1, August '44, pp. 506-509.
Face milling cutters, especially of hard metal, are often superior to planer tools for roughing, smoothing or finishing as well as for machining cast iron, steel or light metal. The accuracy and the surface finish of all the milled faces are the same and therefore meet high demands.

20-335. **United States Rubber Company; Maker and User of Machine Tools.** Fred B. Stauffer. *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 30, 38.
Types of metal-working machinery produced by the U. S. Rubber plant.

20-336. **Modern Milling-Cutter Production.** F. Müller. *Werkstattstechnik der Betrieb*, v. 37/22, no. 4, April '43, pp. 153-154. *Engineers' Digest*, v. 1, August '44, pp. 514-515.
Production of large cutters of the disc type with diameters up to 520 mm. and cutting edges up to 35 mm. of a welded composite type.

20-337. **Recent Progress in High Speed Tapping.** C. W. Hinman. *Modern Machine Shop*, v. 17, Sept. '44, pp. 164-166, 168, 170, 172, 174, 176, 178, 180, 182.
Tapping machine improvements — lubricants and coolants—special tapping fixtures.

20-338. **Arbor Adapter for Gear Cutter.** *Modern Machine Shop*, v. 17, Sept. '44, p. 210.
Faster and more accurate positioning of the small arbors used in the cutting of small precision gears.

20-339. **New Records in Face Milling.** Guy Hubbard. *Steel*, v. 115, Sept. 4, '44, pp. 84-85, 144, 146, 148.
Advantages of face milling.

20-340. **Machining Operations on Anti-Aircraft Gun Mountings.** *Machinery* (London), v. 65, July 13, '44, pp. 29-33.
Effectiveness of the 90-mm. anti-aircraft gun due to the ease and exactitude with which it can be aimed in response to the range-finder control. This arises from the accuracy with which the traversing assembly, elevating assembly, and levelling assembly—all units of the gun mount—are built. Examples of work done on these assemblies described.

20-341. **Hob-Tooth Profiles for Spline Hobbing.** J. G. Smith. *Machinery* (London), v. 65, July 13, '44, pp. 35-39.
Line of action and basic rack; the hobbing process; analytical method; grinding clearance.

20-342. **A Lathe Converted into a Broaching Machine.** R. C. Newton. *Metal Progress*, v. 46, Sept. '44, p. 486.
Broaching lugs in the interior of some 2-in. rings by adapting a lathe with a chuck holding a bronze nut, a lead screw, a steel sleeve attaching the broach, and the work holder on the tool rest.

20-343. **Friction Cutting.** *Aircraft Production*, v. 6, August '44, pp. 403-404.
High speed sawing process suitable for most types of material.

20-344. **High Velocities in Band Saw Performance.** H. J. Chamberland. *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 166, 168, 170, 172, 174, 176, 178, 180, 182, 184, 186, 188, 190.
Equipment described incorporates all-purpose design; results depend on using the correct type of saw to suit the nature of the material being cut and use of the saw according to recommendations.

20-345. **Composite Hob May Solve Marine Gear Bottleneck.** *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 199-200, 202, 204, 206, 208.
Consists of a hob body and mechanically held strips of cemented carbide for the cutting edges.

20-346. **Let's Talk Shop.** *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 265-266, 268, 270, 272, 274, 276, 278, 280, 282, 284, 286.
Staggered tooth vertical milling cutter; checking pump gears; coffin jacks eliminate liner shrinkage gaps; reclaiming old pipe; multi-spindle mill cuts boring time; umbrella type assembly bench; double-edge milling cutter eliminates one operation; special tool catalog; die handling; climb milling with single carbide blade.

20-347. **Jigs for a Gear Bracket.** N. D. P. *Machinery* (London), v. 65, August 3, '44, p. 121.
Jig used in drilling and reaming operations on the flange of a special gear bracket.

20-348. **The Standardization of Tube Jigs.** F. E. Callow. *Machinery* (London), v. 65, August 17, '44, p. 183.
Location buttons eliminate distortion in drilling. Casting does not require machining to fit the various diameters of tubes. Buttons are of standard design for all types of jigs, being case hardened and ground on assembly. They are easily replaceable in the event of wear, or alteration in the diameter of the tube.

20-349. **The Production of the Wickman 5-Spindle Automatic.** *Machinery* (London), v. 65, August 17, '44, pp. 169-175.
Assembly and testing operations.

20-350. **Mass Production in Heavy Industry.** Jerome Wilford. *Tool Engineer*, v. 14, Sept. '44, pp. 67-69.
A West Coast manufacturing leader tooled for high output of heavy parts from standard machine tools. Materials handling was aided by portable tools taken to the work.

20-351. **Machining Magnesium.** A. M. Lennie. *Tool Engineer*, v. 14, Sept. '44, pp. 70-73.
One of the easiest metals to machine, magnesium improperly handled can be dangerous. Shop-proved practice for important machining operations, with recommended methods for fire precaution.

20-352. **Special Tooling and Machines for Economy in Production.** *Tool Engineer*, v. 14, Sept. '44, pp. 78-82.
Automatics replace older equipment; multiple checking fixture; brazing facilitates use of stampings; truck frame inversion fixture; heavy-duty truck assembly.

20-353. **Heavy Tapping.** A. E. Rylander. *Tool Engineer*, v. 14, Sept. '44, pp. 86-87.
Tapping and drilling methods may economically supplement conventional lathe practice. Attachments may be used and re-used profitably on long or short runs.

20-354. **Aids to High Production Tapping.** Mark Graves. *Tool Engineer*, v. 14, Sept. '44, pp. 91-94.
Increased use of universal tapping and threading machines has sharpened need for information on speeds and feed, drill sizes for the per cent of thread desired, lubrication, and hole preparation. Here is up-to-the-minute data from an authority.

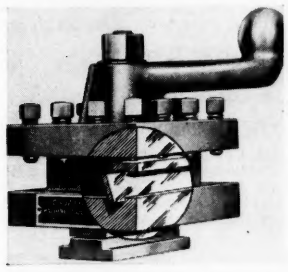
20-355. **Using Negative Rake Tools in Aircraft-Parts Production.** J. Q. Holmes. *Mechanical Engineering*, v. 66, Sept. '44, pp. 576-580.
Negative rake cutting investigated; putting the new process into production; milling operations; operating precautions must be taken; tooth load and number of teeth; power requirements.

NEW PRODUCTS IN REVIEW

TOOL POST TURRET

Crozier Machine Tool Co., Hawthorne, Calif.

An improvement in tool post turret design is announced by this company, successors to the C-W-C Corp. This turret, said to be the first for bench lathes, is now specially adapted for cutting-off operations. One side of the block is channeled to receive a standard beveled section cut-off blade, which is supported at the top by a hardened channeled bar. The bar provides maximum bearing surface for the locking bolts, thus quickly and positively centering and holding the blade in correct vertical position. There is no overhang of the holder, and only sufficient tool extends to the required depth of cut.



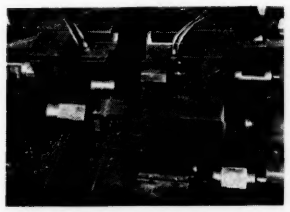
This arrangement assures perfect rigidity, materially reduces setup time and increases production, by chatterless operation.

Mention R562 When Writing or Using Reader Service.

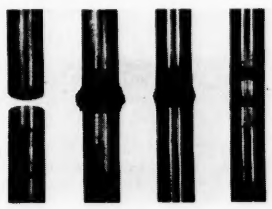
FLASH WELDING ADVANCES

Resistance Welder Manufacturers Association,
505 Arch St., Philadelphia 6, Pa.

Savings in the manufacture of twist drills have been affected by the flash welding of high speed steel stock to a chromium-nickel shank. This illustration shows the process of welding an exceptionally large size drill and it is to be noted that the drill stock is welded to the shank before twisting—an example of the strength of such a weld. After twisting, the drill is hardened and finished.



The photo below shows four steps in the end-to-end flash welding of a cold rolled steel rod. Similar procedure is followed in the edge-to-edge welding of metals.



The first illustration shows the two ends of the steel rod before the flash welding operation. The second shows the flash (extrusion) resulting from the weld. In the third illustration, this flash has been removed and, in the fourth, the rods have been machined to the desired size. The finished weld is as strong as the parent metal itself and presents a smooth surface capable of taking any finish that might be applied to the latter. The RWMA offers to answer any questions on the possibilities of resistance welding.

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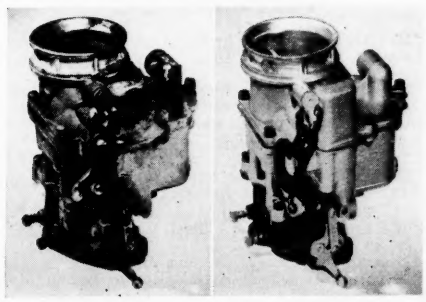
ZINCTONE

Turco Products, Inc.,
6135 S. Central Ave., Los Angeles 1, Calif.



Zinctone, a quick chemical process for brightening and improving the corrosion resistance of zinc alloy die castings, is a new development here. This process seals the outer skin of the casting, helping to protect it from mechanical penetration and corrosive attack. At the same time, it produces a smooth, bright surface which compares favorably with the finish produced by mechanical polishing or buffing.

Adaptable to both small shop and mass production setups, the procedure makes use of simple, easily available immersion equipment. Illustrated is a carburetor before and after Zinctone treatment.

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PHOTO-LAYOUT MATERIALS

Eastman Kodak Co., Rochester, N. Y.

Materials for a simplified method of printing working drawings directly on metal are announced as Kodak Layout Paint and Layout Paint Primer. As the name of the latter implies, it acts as a subbing base for the paint. The new method is said to be of widespread applicability for the production of products involving flat metal parts.

This paint is sprayed in ordinary room light directly on virtually any primed metal surface with a conventional spray gun, after the surface has been cleaned reasonably free of loose dirt and grease. Drying takes place rapidly and the prepared metal is ready for immediate use or it can be safely stored for a reasonable time in a dark place. The drawing, which has been previously prepared with black ink on a transparent or translucent material, is next laid in contact with the prepared surface and an exposure of a few minutes made to arc or mercury vapor lights. The drawing is removed and the metal flooded with warm, weak ammonia water. A vigorous spray of tap water follows which washes away the entire exposed coating, leaving only white lines where black lines appeared on the drawing. Another thin spray coat of primer protects the finished product.

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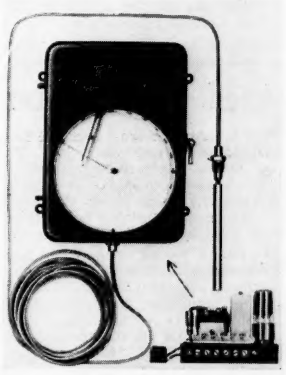
AUTOMATIC CONTROL INSTRUMENTS

The Bristol Co., Waterbury 91, Conn.

A new electronic-type controller, known as Bristol's Free-Vane Electronic Controller, operates on the shielding effect of a vane passing between two coils in an electronic circuit. Recording and indicating models are offered for automatic control of temperature, pressure, liquid level and humidity.



New controller for temperature is offered in ranges from —125 to 1000° F. for use in conjunction with motor and solenoid valves, relays, main line switches and other fuel control apparatus for controlling temperature in electric, oil, gas fired and steam heat ovens, dryers, and oil baths. Bulletin B220 describes the controller.

Mention R566 When Writing or Using Reader Service.

ALKALINE STRIPPING BATH

United Chromium, Inc., 51 E. 42nd St., New York 17, N. Y.

Now that chromic acid and sodium cyanide are under government allocation, platers are said to be making increasing use of Unichrome Alkaline Stripping Bath for removing copper, chromium, cadmium, zinc, tin and other electrodeposited metals from steel and cast iron. This process does not etch or pit the base metal, so that stripped parts may be used just as they come from the bath. If replating is desired, no mechanical refinishing is needed, with consequent savings in labor, grinding and buffing materials.

The bath is made up by dissolving 2 lb. of Unichrome Strip Salt in water, and adjusting the pH. Stripping is then ready to start. Moderate operating temperatures, from 80 to 180° F., involve few heat losses. Current densities range from 100 to 175 amperes per sq. ft. Recommended equipment consists of an unlined steel tank with a plain steel heating coil, together with facilities for rinsing. Ordinary steel or copper electrodes are used, depending on the metal to be stripped.

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VERSATILE MARKER

Floquil Products, Inc., 1974 Broadway, New York 23, N. Y.

More than 100 basic materials can be marked with the Floquil Fountain Marker, which consists of only three non-moving parts. There are twelve instantly interchangeable nibs requiring no tools to take off or put on. There are seven standard colors for use with these markers. Colors are instantly drying, water, weather and abrasion proof.

Mention R568 When Writing or Using Reader Service.

CLEAN OR BRIGHT ANNEALING FURNACE

W. S. Rockwell Co., New York, N. Y.

A new furnace has been completed in which coils of silver solder wire are clean annealed in an open fired chamber without the need for muffles or external atmosphere generating units. Desired atmosphere in the furnace is accurately controlled from the gas proportioning equipment which regulates the air-gas supply to the burners.

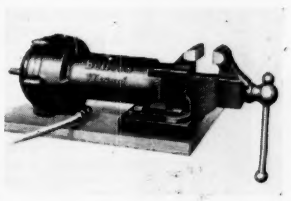
This furnace has a continuous mesh belt conveyor which carries the solder through an entrance vestibule, the heating chamber and the cooling section, the latter two being kept filled with the atmosphere formed by the burning of the gas in the furnace chamber. Such an atmosphere is also found satisfactory for bright annealing and clean annealing of copper, brass, nickel silver and sterling silver products. However, the furnace can be equipped with an alloy muffle for bright annealing other materials which would require special atmospheres produced in an outside generator. The time of work in the furnace can be set for a range of 10 to 60 min.

Mention R569 When Writing or Using Reader Service.

AUTOMATIC BENCH VISE

The Bellows Co., Akron, Ohio.

Vispeed, a new, powerful air or hand-operated bench vise, is the newest addition to a line of controlled air power devices. It consists of a standard 4-in. Reed bench vise operated by a powerful 8-in. foot-controlled air cylinder. Clamping pressures are adjustable from zero up to 2½ tons, the practical safety limit of the vise itself.



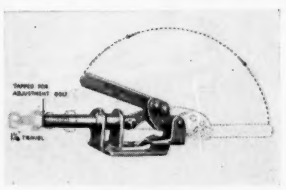
Vispeed operates through the full range of the 6-in. jaw opening of the vise. Positive safety control limits the air-powered movement of the movable jaws adjustable from zero to a maximum of 1 in. It is foot controlled, leaving both hands free to handle work. It is available as a complete packaged unit, consisting of a 4-in. standard Reed bench vise, an 8-in. air cylinder, pressure regulator, gage, quick exhaust valve, air hose and foot pedal assembly, or the air unit may be purchased separately for easy attachment to any standard 4-in. or 4½-in. vise.

Mention R570 When Writing or Using Reader Service.

PUSH AND PULL LOCK CLAMP

Detroit Stamping Co., 378 Midland Ave., Detroit 3, Mich.

A push and pull action clamp has recently been added to the De-Sta-Cox line as the model No. 605 toggle clamp. This clamp is especially well suited for locating and indexing. The work end of the clamp (plunger rod) is tapped to receive a ⅜-in-18, standard threaded bolt, which provides quick adjustment to suit the job at hand. Travel distance of plunger rod is 1¼ in.



By simply relocating one of the handle bolts this clamp may be converted from push to pull action or vice versa. The clamp weighs but 9 oz., and when in push locked position measures 5½ in. long, 2¼ in. wide and 2⅝ in. high. When used as a pull clamp, in locked position it is 7⅞ in. long, 2¼ in. wide and 2½ in. high. The clamp has a bright, silvery, rust resisting plated finish. Complete descriptive literature is available.

Mention R571 When Writing or Using Reader Service.

CASING SALT

G. S. Rogers & Co., 228 N. La Salle St., Chicago 1, Ill.

Specification No. 33 Casing Salt has been developed to alleviate the limitation on sodium cyanide for heat treating. In many cases, users of No. 33 have reported advantages not obtainable with sodium cyanide, such as faster penetration of the steel, time cycle reductions, a better case structure and easier cleaning. This new product is recommended to provide case depths up to 0.009 in. and is particularly desirable for thin steel sections.

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To Select The Correct Steel For The Product, To Take Advantage of Steel's Available Qualities For Most Efficient Use

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WHAT STEEL SHALL I USE?
By Gordon T. Williams, Metallurgist Deere & Co.

CONTENTS . . . Selection of Steels as Affected by Tensile Properties . . . As Affected by Endurance Limit . . . Impact and Hardness Tests; Notes on Their Practical Use . . . Wear, and What Can Be Done About It . . . Metallurgical Factors in Selection of Steels . . . Properties of Steel as Purchased . . . What Alloy Should Be Used . . . Utility of Case-hardening Steels . . . Considerations in Fabrication . . . Economics of Steel Selection . . . Problems and Service Failures.

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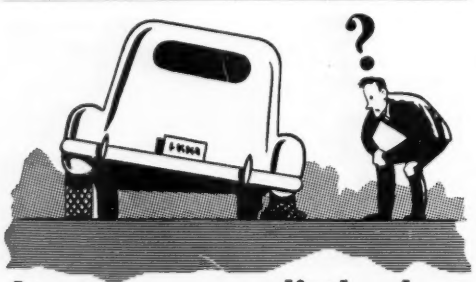

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Metal Literature Review—*Continued*

20. MACHINING (*cont.*)

20-356. **New Lathe Speeds Machining of Crankpins.** *Product Engineering*, v. 15, Sept. '44, pp. 590-593.
Tools are carried around the work which is supported in a stationary position on stanchions.

20-357. **Cost of Parts Finished by Grinding is Reduced by Correct Design.** S. H. Neady. *Product Engineering*, v. 15, Sept. '44, pp. 632-634.
Production considerations and practice that should govern the design of ground cylindrical parts to obtain low cost. Original and redesigned parts described to show how time-wasting operations can be eliminated and the performance and life of grinding wheels increased by correct design.

20-358. **Basic Mechanics of the Metal-Cutting Process.** M. Eugene Merchant. *Journal of Applied Mechanics*, v. 11, Sept. '44, pp. A-168-A-175.
A mathematical analysis of the geometry and mechanics of the metal-cutting process, covering two common types of geometry which occur in cutting. This analysis offers a key for the study of engineering problems in the field of metal cutting in terms of such fundamental quantities as strain, rate of shear, friction between chip and tool, shear strength of the metal, work done in shearing the metal and in overcoming friction.

20-359. **Crush Forming Speeds Production of Ground Contours.** John Haydock. *American Machinist*, v. 88, Sept. 14, '44, pp. 98-101.
Hard steel rollers used to dress abrasive wheels to a wide variety of shapes, which in turn can be transferred to the workpiece in a grinding machine.

20-360. **Practical Suggestions for Improvement of Twist Drills.** George J. Meyer. *American Machinist*, v. 88, Sept. 14, '44, pp. 106-108.
New ideas in twist drill design, including a completely different method of driving and chucking.

20-361. **Practical Ideas.** *American Machinist*, v. 88, Sept. 14, '44, pp. 109-114.
Fixture for grinding small tapered sleeves. Milling, drilling tools combined in one set-up. Long stock lathe set-up which eliminates a steadyrest. Lay-off punch holder used as a layout tool. One-position radius grinding fixture. Set-up bar assures accuracy in regrinding milling cutters. Screw tap gage. Freight car doors hung by a lift truck. Stock supports on abrasive cutoff machines. Reconverted trammel proves a handy tool for inspection and layout work. Rubber lower die for forming sharp angles.

20-362. **Unusual Fixtures Employed in Making Torpedo Tail Cones.** Carl G. Preis. *American Machinist*, v. 88, Sept. 14, '44, pp. 121-124.
Naval units made from heavy steel forgings are subjected to careful inspection checks during machining and assembly operations.

21. CLEANING AND FINISHING

21-104. **An Electro-Chemical Descaling Process.** *Metallurgia*, v. 30, June '44, p. 76.
A continuous and non-porous metal film, usually tin, electrodeposited on the work simultaneously with the scale and oxide removal, completely protects the work surface from pitting and etching. This metal film can be removed easily and completely.

21-105. **Cleaning and Descaling Steel by Electrolytic Pickling in Molton Caustic Soda.** N. L. Evans. *Metallurgia*, v. 30, June '44, pp. 97-99.
Investigation is concerned with finding the optimum conditions of time, temperature and current density, and with the occurrence and prevention of brown stains on the work. Certain electrical conditions in the plant have been investigated, and their bearing on plant design discussed.

21-106. **Fatigue Life of Stressed Parts Increased by Shot Peening.** D. C. Turnbull. *American Machinist*, v. 88, August 31, '44, pp. 83-86.
An outgrowth of a cleaning process, shot peening is used to add service life to many types of products. Tests and experiments will show how to get the best results.

21-107. **Effective Cleanser for Aluminum Prior to Spot Welding.** T. E. Piper. *Metal Progress*, v. 46, Sept. '44, p. 485.
A one-step cleaning and etch method, applicable to assemblies of details, jigged and held together temporarily by fasteners of various sorts.

21-108. **Short Cycle Anodizing.** George Maynard and A. A. Baudat. *Metal Progress*, v. 46, Sept. '44, pp. 485-486.
Short anodizing process for aluminum and its alloys containing less than 5% copper. Coupled with a solution control method, it gives a slightly better anodic film than the process in general use.

21-109. **Shot for Metal Peening.** Oscar E. Harder and James T. Gow. American Society for Metals. 1944 Preprint No. 32, 9 pp.
Heat treated shot is subjected to heating to decompose the massive carbides and cooled to produce different hardnesses in the range of 200 to over 500 Brinell equivalent, or quenched to a martensitic structure and tempered to a desired hardness. Typical chemical compositions and hardness values given, and photomicrographs illustrative of the various materials included.

21-110. **Pickling.** Frank Taylor. *Iron and Steel*, v. 17, July '44, pp. 525-527.
Evolution of the modern descaler for ferrous bases.

21-111. **The Surface Treatment of Alclad 24S-T Prior to Spot Welding.** W. F. Hess, R. A. Wyant, and B. L. Averbach. *Welding Journal*, v. 23, August '44, pp. 402-s-413-s.
Chemical treatment can produce low and consistent surface resistances on nitrate-treated Alcald 24S-T for spot welding, provided the surfaces have been properly pre-cleaned and are free from baked-in oil or grease. Several solutions of effective oxide removers cited. 4 ref.

21-112. **Continuous Straight Line Operation.** Gerald Eldridge Stedman. *Metal Finishing*, v. 42, Sept. '44, pp. 539-542.
Equipment and details of the cleaning process.

21-113. **Semi-Continuous Pickling of Strip.** C. F. Buente. *Metal Finishing*, v. 42, Sept. '44, pp. 543-544, 546.
A small counter current applied between a zinc anode (as cathode) and a steel plate in the bath (as anode) is highly effective in eliminating chemical attack of the zinc.

21-114. **Electropolishing.** Charles L. Faust. American Electroplaters Society *Monthly Review*, v. 31, Sept. '44, pp. 807-815.
Finishing for appearance; methods; corrosion protection by electropolishing; electropolishing for reasons other than for appearance; electro-polishing for finishing before plating.

21-115. **Finishing Padlocks.** *Die Casting*, v. 2, Sept. '44, pp. 69, 72, 74.
Care exercised in preparing surfaces, as well as in applying non-metallic finishes and baking, insures enduring coatings in "Yale" die cast products.

21-116. **Finishing Metal Containers for .75 Millimeter Shells.** J. E. Sump. *Products Finishing*, v. 8, Sept. '44, pp. 24-26, 28.
After cleaning and bonderizing, the containers are dried off by conveying through the 13-ft. long drying-off oven, illustrated.

21-117. **Increasing Efficiency in Metal Finishing. III.** Jeffrey R. Stewart. *Products Finishing*, v. 8, Sept. '44, pp. 54-56, 58, 60.
Use of sealing compounds based on synthetic resins. Blackening stainless steel; Azo pigment dyes; heating metal prior to painting.

21-118. **The Finishing Room Grows Up.** Bryant W. Pocock. *Products Finishing*, v. 8, Sept. '44, pp. 62, 64, 66, 68, 70.
Increased production; probable goals; laboratory control; safety; recovery of paint.

21-119. **Survey of Chemically Cleaning Aluminum Alloys for Spot-Welding.** F. M. Morris. American Welding Society Preprint, Oct. '44.
Survey of 50 aircraft companies; questionnaire pertained to materials for pre-cleaning and oxide removal and methods of procedure, control of solution strength, and production spot welding results. Summary of the answers.

21-120. **Paint Drying with Infra-Red Radiant Gas Burners.** Wm. H. Tesmer. *Industrial Heating*, v. 11, Sept. '44, pp. 1482, 1487-1488, 1490.
The gas-fired refractory type infra-red burner, when employed with a recirculating system as in paint drying will offer decided advantages, such as markedly reduced fuel costs, and will equal or better speed of production as compared with lamps; and provides up to 300% increase in production as compared with indirect-gas-fired equipment, without reformulation of paint.

21-121. **Electrolytic Pickling of Steel in Molten Caustic Soda.** *Industrial Heating*, v. 11, Sept. '44, p. 1492.
Produces a highly satisfactory surface for subsequent operations such as plating, galvanizing, tinning, vitreous enameling, painting. It imparts to the steel a mild degree of resistance to rusting, and hydrogen is not absorbed as in certain other scale-removal methods. Metallic losses are minimized and consumption of chemical is low.

21-122. **Synthetic Rubber Has Long Life In Blast-Cleaning Service.** H. E. Linsley. *American Machinist*, v. 88, Sept. 28, '44, pp. 112-114.
Rubber used in rotating blades, protective curtains and masks improves life of cleaning units used on Cyclone engine cylinders and conserves critical abrasive.

21-123. **The Latest United Semi-Continuous Pickler.** C. F. Buente. *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1068-1070.
Description and advantages of method.

21-124. **What to Consider When Choosing the Right Metal Cleaner.** G. C. Close. *Industrial Finishing*, v. 20, Sept. '44, pp. 34, 36, 38.
Characteristics of liquid metal cleaners.

21-125. **Semicontinuous Strip Pickler Handles Individual Coils.** C. F. Buente. *Steel*, v. 115, Sept. 25, '44, pp. 90, 92.
Elimination of welder or stitcher, looping pits and shear usually found in continuous lines reduces floor space required and minimizes installation, operation and maintenance costs. Quick pickling action secured by immersing the piece in a hot water bath at the front end of line to remove particles of scale and increase temperature of strip.

22. WELDING, BRAZING AND FLAME CUTTING

22-386. **Recent Progress in the Application of Welding to Steel. II.** Wendell F. Hess. *Steel Processing*, v. 30, August '44, pp. 501-503.
Examples for arc welding and for electric resistance spot welding to illustrate the steps involved in the determination of proper welding conditions.

22-387. **Controlled Atmosphere Furnace Brazing.** A. K. Phillippi. *Steel Processing*, v. 30, August '44, pp. 517-519.
Design of articles for brazing; methods of joining parts; types of brazing furnaces.

22-388. **Joining Aluminum Alloy.** E. C. Hartmann, G. O. Hoglund and M. A. Miller. *Steel*, v. 115, August 28, '44, pp. 96, 99, 100, 124, 126.
Brazing procedure. Sections from 0.006 to ½ in. may be readily joined. Physical properties and design factors discussed.

22-389. **Tooling for Magnesium Welding.** Kenneth L. Kime. *Iron Age*, v. 154, August 31, '44, pp. 33-40.
Analysis of hold down devices, stiffeners and other tool elements. Illustrates the adaptability of heavy drop hammer dies for the bases of the welding jigs.

22-390. **Copper Brazing.** T. L. Davies. *Aircraft Production*, v. 6, July '44, pp. 346-351.
Process for building up components. Brazing process; method of procedure; strength of brazed parts; joint clearances; distortion; suitable materials; gas atmospheres practical applications; airscrew spider.

22-391. **Welding Fixtures. II.** Harold B. Pereira. *Aircraft Production*, v. 6, July '44, pp. 352-354.
Production of a tubular engine mounting for an in-line power unit.

A.S.M. Review of Current Metal Literature—*Continued*

22. WELDING (*Cont.*)

22-392. **Welding and Production.** J. Henderson. *Engineering*, v. 157, June 30, '44, pp. 517-519.
Designing for arc welding.

22-393. **Foundry Mold Jackets Assembled by Welding.** Roger Vander Velden. *Foundry*, v. 72, Sept. '44, p. 136.
Making mold jackets which support the sand after the mold has been stripped from the machine flask and while the molten metal is being poured.

22-394. **Heat Shock Testing.** *Westinghouse Engineer*, v. 4, Sept. '44, pp. 142-143.
Uses a resistance welder to make an accelerated heat-shock test on alloy samples of simple shape.

22-395. **Flame Cutting Under Water.** George R. Reiss. *Steel*, v. 115, Sept. 4, '44, pp. 80-81, 136, 138.
Eliminates problem of distortion, avoids straightening operations, affords closer tolerances, cuts down amount of excess metal that must be allowed and thus reduces cost of finish machining.

22-396. **Joining Aluminum Alloys.** E. C. Hartmann, G. O. Hoglund and H. A. Miller. *Steel*, v. 115, Sept. 4, '44, pp. 102, 105-106, 140.
Soldering has been considered least as a method of joining light alloys, yet it comprises an excellent fabricating process in many instances. Where resistance to corrosion is a factor, other types of joining are advised. Previous articles covered riveting, welding and brazing.

22-397. **Test of ½-Continuous Welds to Replace 3-In. Intermittent Welds. I.** M. H. MacKusick. *Welding Journal*, v. 23, August '44, pp. 685-691.
Long increment welds can be substituted for conventional 3-in. increment welds for the purpose of securing stiffeners to ships' plating. Long increment welds of equivalent strength will behave under pressure loading in a similar manner to 3-in. conventional welds.

22-398. **Stresses in Fillet Welds with Eccentric Loads.** M. F. Spotts. *Welding Journal*, v. 23, August '44, pp. 692-695.
Method of computing the stress briefly reviewed. Method extended to the case of fillet welds carrying moment loads. Use of this latter method illustrated by numerical examples. 2 ref.

22-399. **Resistance Welding Equipment—Designed for Production.** Clyde F. Kaunitz. *Welding Journal*, v. 23, August '44, pp. 696-697.
Fundamentals of the welding machine.

22-400. **Metallic Arc-Welding Electrodes. V.** Harold Lawrence. *Welding Journal*, v. 23, August '44, pp. 698-709.
Class E6013 electrodes; Class E6020 and E6030 electrodes; Class E7010 electrodes; Class E7020 electrodes.

22-401. **Proposed Recommended Practices for Resistance Welding.** *Welding Journal*, v. 23, August '44, pp. 713-717.
Recommended practice for the spot, seam and pulsation welding of low carbon steel (including coated steels), and spot and seam welding of stainless steel.

22-402. **Controlled Low Temperature Stress Relief.** T. W. Greene and A. A. Holzbaur. *Welding Journal*, v. 23, August '44, pp. 369-s-371-s.
Results of the investigation of the controlled low temperature stress relief prove that the residual welding stresses can be effectively reduced, and that the operation can be performed quickly, efficiently and economically on the critical welded joints in a ship.

22-403. **The Spot-Welding Properties of Rust-Proofed Mild Steel Sheet.** W. S. Simmie and A. J. Hipperson. *Welding Journal*, v. 23, August '44, pp. 371-s-375-s.
Objects: To determine which surfaces permitted satisfactory spot welding; study the effect of the spot-welding process on the corrosion resistances of those surfaces which permitted satisfactory spot welding; examine the effect of each surface which permits satisfactory spot welding on the life of the welding electrode tips; determine the effect of those surfaces permitting spot welding on the strength of weld produced.

22-404. **Determination of Cooling Rates of Butt and Fillet Welds as a Result of Arc Welding with Various Types of Electrode on Plain Carbon Steel.** W. F. Hess, E. F. Nippes, L. L. Merrill and A. P. Bunk. *Welding Journal*, v. 23, August '44, pp. 376-s-391-s.
The cooling rates resulting from welding with austenitic electrodes on mild steel plate are essentially the same as those obtained by welding at the same values of energy input with mild steel electrodes on mild steel plate. The cooling rates resulting from the making of butt welds at the same energy input with a variety of plain low carbon and alloy steel rods on 1-in. plate at 72° F. are identical, regardless of the type of electrode used. The cooling rates associated with the making of butt welds using bare electrodes are essentially the same as those obtained with shielded type electrodes.

22-405. **Magnetic Oscillograph Equipment for Development of Aluminum Alloy Spot Welding and Production Control of Welding Machines.** G. W. Scott and A. A. Burr. *Welding Journal*, v. 23, August '44, pp. 392-s-401-s.
Oscillograph to measure the important variables involved in the spot or seam welding of light alloys such as aluminum or magnesium. Used to determine the optimum production spot-welding procedure; to study spot-weld consistency; to increase spot-welding rates without sacrificing consistency; to make welding machine dial calibrations; to isolate trouble quickly in case of poor welding or actual breakdown; and to make a routine monthly check. 2 ref.

22-406. **Value of Preheating in Welded Ship Construction.** James W. Wilson. *Welding Journal*, v. 23, August '44, pp. 414-s-416-s.
Analysis of failures on vessels built under adverse weather conditions. Endeavor to eliminate the tendencies to cracking by applying heat treatment to the metal. Preheating is only method practicable in ship welding.

22-407. **The Welding of Light Alloys.** I. H. Hogg. *Metal Treatment*, v. 11, Summer '44, pp. 71-82.
Considerations affecting the use of welding for light alloys, some methods available for performing the duty, and a few matters requiring attention in practice. As fusion welding is already generally well known, consideration is given mainly to the innovations concerned with spot welding. 2 ref.

22-408. **Hydrogen and the Weld Cracking of Alloy Steels.** G. L. Hopkin. *Metal Treatment*, v. 11, Summer '44, pp. 125-130.
Experiments are described which demonstrate that hydrogen plays a very important part in causing cracking and appears to be the factor mainly responsible for the different results obtained with different electrodes when other conditions are constant. 4 ref.

22-409. **Conveyor Boosts Welding Output by 70 Per Cent.** *Iron Age*, v. 154, Sept. 7, '44, pp. 78-80.
With this welding conveyor system built along simple lines eight welders are able to meet the high production rate of 145 lift truck tower assemblies per week, aided only by two helpers in place of the eight helpers previously required.

22-410. **Cut Gates and Risers Closely.** George Bellew. *Metal Progress*, v. 46, Sept. '44, p. 487.
A special machine for flame cutting gates and risers from heavy circular castings; better than hand cutting because it makes a closer marginal cut, leaving only the barest minimum of metal to be ground off.

22-411. **Fracture Strains of Soldered Joints.** F. Berman & R. H. Harrington. American Society for Metals, 1944 Preprint, No. 39, 13 pp.
Small pieces of copper were soldered end to end under various conditions and were then bent at the joint to encourage fracture. In vacuum application, reheating of the joint in air, in the range of 500 to 700° C., will, upon subsequent fracturing, disclose oxidized surfaces, indicative of joints that would leak. Some copper to copper joints are best made with eutectic Ag-Cu alloy by soldering at 800° C., rather than at the conventionally higher temperatures.

22-412. **Brazing Aluminum Alloys.** *Canadian Metals and Metallurgical Industries*, v. 7, Sept. '44, p. 41.
Furnace brazing, torch brazing, dip brazing, cleaning joints after brazing.

22-413. **Welding Current Distribution System Saves Time and Space.** C. E. Schirmer. *Industry & Power*, v. 47, Sept. '44, p. 73.
Easily made conductor bars and insulating supporting brackets transmit welding current for instant use at various points in the shop.

22-414. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel*, v. 115, Sept. 11, '44, pp. 98-101, 114, 146.
Features and applications of stainless steel electrodes.

22-415. **Joining Aluminum Alloys.** E. C. Hartmann and G. O. Hoglund. *Steel*, v. 115, Sept. 11, '44, pp. 116, 156, 158, 160, 162, 164.
Resin-bonding method for making metal-to-metal and metal-to-nonmetal joints. Successful for confidential war applications.

22-416. **Joint Preparation for Brazing of Tools.** *Industry and Welding*, v. 17, Sept. '44, pp. 35-37, 90-94, 96.
What to do to conserve a highly critical group of tool steel parts.

22-417. **Good Practices in the Operation of Acetylene Generators.** *Industry and Welding*, v. 17, Sept. '44, pp. 38-39, 62-64, 66.
Recommendations specifically directed to the shipbuilding industry, but applicable wherever acetylene generators are used.

22-418. **Drop-Off Tanks for Fighters.** *Industry and Welding*, v. 17, Sept. '44, pp. 40-41, 44, 101-103.
Laminar flow drop-off tank high production rate achieved by coordination of stationary and moving production lines.

22-419. **Speed to Strip.** *Industry and Welding*, v. 17, Sept. '44, pp. 48-50.
Welding shows the way in another industry.

22-420. **Oxy-Acetylene Pipe Line Systems for Large Plants.** *Industry and Welding*, v. 17, Sept. '44, pp. 58, 60-61, 84-89.
Contribution of the welding trade to heavy or production line industries; theory and practice followed in determining the correct pipe sizes for each load point.

22-421. **Wrecked Punch Press Ram Brazed with a Novel Procedure.** R. Kraus. *Industry and Welding*, v. 17, Sept. '44, pp. 45-47, 68, 70, 72-73.
The repair of a large cast iron ram and the reason why certain methods were applied.

22-422. **Worn Lathe Spindle Repaired by Welding.** *American Machinist*, v. 88, Sept. 14, '44, p. 97.
Worn section of the spindle was first turned down with the temporary cutting tool arrangement. The holder was fabricated from scrap steel parts welded together. The worn surface was built up with two passes of 5/32-in. shielded arc electrode for mild steel. The weld beads were laid longitudinally on the spindle.

22-423. **Low Temperature Welding Expedites Repairs.** Clinton L. Swift. *Aviation*, v. 43, Sept. '44, pp. 142-143.
Low melting point, high strength welding with Eutectic alloys saves gas and time, frequently permits much easier fabrication.

22-424. **Design Data for Spot Welds in Aluminum Alloy Sheets.** James Ralston. *Product Engineering*, v. 15, Sept. '44, pp. 608-611.
Welding principles and basic considerations that govern the design of spot welded parts made of aluminum alloy sheets are enumerated, with data pertaining to weldability of different aluminum alloys, mechanical properties of spot welded joints, gage combinations, spot spacing, edge distances and surface preparation.

22-425. **Welding Transformer Tanks.** H. W. Allison. *Welding Engineer*, v. 29, Sept. '44, pp. 38-39.
A large power-transformer tank must have permanent oil tightness and a mechanical strength capable of supporting from six to eight times its own weight; all-welded construction is being used to replace the older method of riveting.

22-426. **336 Liberty Ships.** Don Llewellyn. *Welding Engineer*, v. 29, Sept. '44, pp. 40-41.
It took 14,464 miles of welding to build the 336 Liberties completed by Calship in a period of 28 months.

22-427. **Cutting Cast Iron.** R. A. Brady. *Welding Engineer*, v. 29, Sept. '44, p. 41.
Cutting cast iron articles with an ordinary cutting torch.

22-428. **Welded Sternwheel Shaft.** *Welding Engineer*, v. 29, Sept. '44, pp. 49-50, 52.
Thermit welding used to repair a broken steel shaft 31 in. in diameter and weighing 40 tons.

22-429. **New Tips From Old.** Al Lake. *Welding Engineer*, v. 29, Sept. '44, pp. 54, 56.
Damaged welding and cutting tips are being reconditioned for double and treble service by the use of specially built equipment in the tool room.

22-430. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel*, v. 115, Sept. 18, '44, pp. 110-111, 166, 168, 170, 172, 174, 176.
Hard surfacing electrodes range in price from less than 20 cents to several dollars per pound but selection of more expensive types for many applications often is more economical.

22-431. **Helium Welding of Magnesium.** F. A. Wassell. *Steel*, v. 115, Sept. 18, '44, pp. 125-126, 128.
Process may be likened to carbon arc welding. Apparatus used consists essentially of a tungsten electrode and a gas nozzle or cup which surrounds the electrode.

22-432. **The Flash Welding of Alloy Steel—Metallurgical and Physical Characteristics.** J. C. Barrett. American Welding Society Preprint, Oct. '44.
Properties of flash welds in alloy steels; structural zones in a flash weld and the hardness values to be expected in these zones followed by a consideration of the properties to be expected in both as welded and heat treated welds. Upset fiber also discussed.

22-433. **Evolution of Welding in Shipbuilding.** M. N. Maltseff. American Welding Society Preprint, Oct. '44.
Value of streamlining and balancing of connection and joints. Shelter deck will, no doubt, have an entirely different appearance; no large square openings that abruptly change cross-sections of the deck plating to form hatches; gunwale will be eliminated. Welded hull presents a monolithic structure, so connections and joints should be simple and structurally balanced.

22-434. **Multi-Arc Welding of Aluminum Alloys.** M. R. Rivenburgh and C. W. Steward. American Welding Society Preprint, Oct. '44.
Essential elements of the process, its operation and function.

22-435. **Small Portable Condenser Welding Set.** E. M. Callender. American Welding Society Preprint, Oct. '44.
Description of a portable discharge welder and other related equipment such as the portable power plant; some discharge welder fundamentals covered, with especial reference to the influence of the welding transformer. Certain principles are brought out in relation to the method of "short time" welding employed in the discharge welder. Photographs of the equipment, photomicrographs of a weld etch, and a table of shear strengths for stainless steel; different modes of current discharge curves also included.

22-436. **Oxy-Acetylene Pressure Welding.** A. R. Lytle. American Welding Society Preprint, Oct. '44.
Technical and mechanical aspects of oxy-acetylene pressure welding.

22-437. **Development and Application of Modern Heavy Coated Arc Welding Electrodes.** D. C. Smith and W. G. Rinehart. American Welding Society Preprint, Oct. '44.
Development of electrode coatings by studying the influence of various coating materials on the arc energy distribution between cathode and anode suggested as a means of evaluating the influence of possible coating materials on their arc behavior. An equal distribution of energy between cathode and anode is desirable for a.c. arc welding. Function of welding slags and how their melting point, density, viscosity and surface tension are used to control the fluidity and quality of the weld metal is pointed out.

22-438. **The Flash-Butt Welding of Alloy Steels—Welding Variables.** J. J. Riley. American Welding Society Preprint, Oct. '44.
Heating period of the weld designated as the flashing action is one of the principal actions to be controlled. The manner in which heating occurs, effect on the work-pieces with changes in rates of energy input, and recognition of correct settings of the machine characteristics to produce satisfactory flashing action discussed. Interpretation of recording meter records to judge the quality of the flashing action covered. Welding variables forming part of the upset action are studied and correlation of dimensional variables is presented in tabular form.

22-439. **Characteristics of Welding Arcs on Aluminum in Atmospheres of Helium and Argon.** F. A. Wassell. American Welding Society Preprint, Oct. '44.
Gas-shielded arc welding of aluminum without the use of flux, based on the use of argon and helium as atmospheres with either a-c or d-c as the power.

22-440. **The Geometry of a Spot Welding Tip and Its Relation to Tip Life.** E. D. Crawford and C. W. Steward. American Welding Society Preprint, Oct. '44.
In spot welding aluminum alloys, if the tip life could be appreciably increased, there would be a noticeable reduction in production costs and a more uniform quality of spot welds. A slightly raised, flat button produces remarkably good tip life.

22-441. **Standard Details for Welded Building Construction.** H. W. Lawson. American Welding Society Preprint, Oct. '44.
Principles of design for beams and their connections. Offers for simply supported beams, a set of welded details which with their capacities, are ready for handbook publication and general professional acceptance.

22-442. **Spotwelding Machines for Heavy Gages of Ferrous and Non-Ferrous Metals.** Mario Sciaky. American Welding Society Preprint, Oct. '44.
How the thickness of material affects the design of the welding machine; how the welders are constructed for heavy gages; characteristics of heavy gage welds.

22-443. **Some Observations on the Welding of Manganese High-Tensile Steels.** W. B. Brooks and A. G. Waggoner. American Welding Society Preprint, Oct. '44.
Study based on the all-weather welding, of ¾-in. or heavier plates. Thirteen commercial manganese steels containing 0.14 to 0.20% C, 1.0 to 1.5% Mn with additions of vanadium or titanium were studied. They had a pronounced tendency to cracking under normal welding conditions, and a highly variable hardenability as determined by the L-Jominy test. Ductility of the heat affected zone measured by the slow notch bend test.

A.S.M. Review of Current Metal Literature — *Continued*

22. WELDING (*Cont.*)

22-444. **Fabrication and Reclamation in Steel Mill Maintenance.** E. W. Gruber. American Welding Society Preprint, Oct. '44.

Plant maintenance and construction work classified under the headings of replacement fabrication, original fabrication, reclamation and repair, and plant maintenance. Fabrication of internal combustion units, copper conductor rolls, complete equipment for oil reclamation, and caustic cleaning tanks by welding. Operation of flame hardening of mill rolls, restoration of worn bronze mill guides, lead burning and integration of lead castings in repairing or replacing lead parts on pickler tanks, and repairs to burned-out tin pots.

22-445. **Welding of Aluminum Tank Cars.** A. H. Woollen. American Welding Society Preprint, Oct. '44.

A welded tank built of Alcoa 35½H plate. Welding was accomplished by using oxy-acetylene, carefully preheating plates prior to welding. Progress accomplished in methods of welding, using the electronic tornado automatic system employing a wire electrode.

22-446. **Fundamentals of Heavy Cutting.** H. G. Hughey and G. L. Walker. American Welding Society Preprint, Oct. '44.

Typical records of cutting steel 12 in. thick and over, bringing out lack of complete information and reference to standards which permit adequate comparison. Emphasis placed upon adequate knowledge of capacity and general characteristics of the torches and tips. Data covering 12 to 36-in. material embodies variations of tip sizes, oxygen flows, oxygen pressures, and cutting speeds.

22-447. **Arc Welding Practices in the Steel Foundry.** Frank Kiper and Lawrence Gabes. American Welding Society Preprint, Oct. '44.

No alloy casting is welded in the as cast state. Rough machining of castings prior to welding eliminates much surface welding. Physical characteristic of heat and corrosion resisting alloys are different from those of steel and must be kept in mind when setting up a welding practice. Some safeguards against carbide precipitation given.

22-448. **The Oxy-Acetylene Process in the Steel Mill.** *Blast Furnace & Steel Plant*, v. 32, Sept. '44, pp. 1076-1079.

Oxy-acetylene operations discussed: Flame-conditioning, lancing operations, open hearth maintenance, machine cutting, and welding shop operations. Consideration of the oxygen piping system will be of assistance in visualizing how the oxy-acetylene process fits into production and maintenance operations.

22-449. **The Application of Arc Welding to Turret Lathe Production.** Henry A. Oldenkamp. *Machinery*, v. 51, Sept. '44, pp. 167-171.

Description of methods employed in the application of arc welding to machine tool building.

22-450. **Metallic Arc Welding Electrodes.** Harold Lawrence. *Steel*, v. 115, Sept. 25, '44, pp. 86, 88, 130, 132, 134.

Excellent joints in cast parts can be made through proper selection of one of several arc welding methods although poor ductility of cast iron has often led welding engineers to approach such jobs with considerable caution. Five types of electrodes may be used.

22-451. **Salt Bath Brazing.** *Steel*, v. 115, Sept. 25, '44, pp. 104, 110.

Reduces rejects, improves finished ordnance parts by selective operation in salt bath furnaces.

23. INDUSTRIAL USES AND APPLICATIONS

23-243. **Plastics and Metals.** G. K. Scribner. *Metals & Alloys*, v. 20, August '44, pp. 336-341.

Shows the engineering and styling advantages and disadvantages of each and their probable future fields of competition and collaboration.

23-244. **Bathtub-Tested Landing Barges.** *Metals & Alloys*, v. 20, August '44, pp. 350-354.

A pictorial presentation.

23-245. **Mass Production Methods Are Applied Successfully in Making Fine-Pitch Gears for Precision Instruments.** K. E. Bauerle. *Steel*, v. 115, August 28, '44, pp. 80-83, 120, 122.

Mass production methods and modern gear finishing processes give a very high degree of uniform accuracy.

23-246. **Production of Torpedo Center Units Requires Heavy-Duty Equipment.** Carl G. Preis. *American Machinist*, v. 88, August 31, '44, pp. 111-116.

Amertorp Corp. plant equipped to make torpedoes used from aircraft, surface vessels and submarines. Consisting of some 5,000 precision-made parts, an airborne torpedo weighs more than a ton and costs approximately $12,000.

23-247. **The Mighty Jeep.** *Steel Processing*, v. 30, August '44, pp. 485-489, 503.

Fabrication and assembly at Willys-Overland Motors.

23-248. **Bearing Metals in the Steel Industry.** S. Epstein and R. C. Hess. *Iron & Steel Engineer*, v. 21, August '44, pp. 83-97.

Modifications in compositions of bearing metals necessitated by war shortages. Many of the improvements will be carried over into peacetime. The design and manufacture of bearings is as important as their composition.

23-249. **Design-Strengthened Materials and Their Applications.** Dimitry E. Olshevsky and Richard S. Smith. *Aero Digest*, v. 46, August 15, '44, pp. 117-118, 120-121, 131, 133.

Design-strengthening results in a material of superior strength and stiffness. Advantages of the application of D-S materials in aircraft construction. Production angles and joining methods are discussed. A general review of avialable sizes, alloys, tempers and patterns is made.

23-250. **Production of Drop-Off Tanks at Weber Showcase Co.** *Modern Industrial Press*, v. 6, August-Sept. '44, pp. 12, 14, 58.

Streamlined, laminar flow drop-off tank.

23-251. **Job Shop Emerges.** G. Eldridge Stedman. *Steel*, v. 15, Sept. 4, '44, pp. 86, 88, 90, 92.

Fabrication of 45-ton, 12-wheel tank trailer for transport and recovery of Army tanks.

23-252. **Piston Rings Become Varied in Design Material, Manufacture, Service, Uses.** Melvin W. Marien. *SAE Journal*, v. 52, Sept. '44, p. 52.

Two types of steel piston rings; steps in manufacture of rings.

23-253. **Marine Engines by Hendy.** Howard Campbell. *Modern Machine Shop*, v. 17, Sept. '44, pp. 124-130, 132, 134.

Story of the Joshua Hendy Iron Works, Sunnyvale, Calif.

23-254. **Notes on Screw Threads.** Harry F. Atkins. *Machinery* (London), v. 65, July 13, '44, pp. 46-47.

Strength and design of bolts and nuts.

23-255. **Messerschmitt Header Tank.** *Foundry Trade Journal*, v. 73, July 27, '44, pp. 255-257.

Examination of materials used in enemy aircraft.

23-256. **Post-War Buildings.** E. G. West and D. V. Pike. *Light Metals*, v. 7, August '44, pp. 361-368.

Theory and practice of the utilization of aluminum alloys in post-war building construction.

23-257. **The Production of Aircraft Stampings.** J. A. Cates. *Aircraft Production*, v. 6, August '44, pp. 362-368.

A review of the laboratory control and manufacturing methods of High Duty Alloys, Ltd.

23-258. **Deflection of Coiled Springs Wound with Initial Tension.** Harold Carlson. *Product Engineering*, v. 15, Sept. '44, pp. 619-621.

Physical factors and manufacturing considerations that affect the design of coiled springs wound with an initial tension. Formulas for computing deflection and torsional stress are included, also curves derived from test data which indicate range of initial tension obtainable in springs of different coil and wire diameters.

23-259. **Railway Equipment.** E. D. Campbell. *Mechanical Engineering*, v. 66, Sept. '44, pp. 605-608.

Potential uses of steels, aluminum, magnesium, and plastics.

23-260. **Fabrication and Assembly of the Weasel.** *Tool Engineer*, v. 14, Sept. '44, pp. 83-85.

Automatic babbitt; application; broach splits piston rod cap; hull welding fixture; special purpose boring machine.

23-261. **Heat Exchangers for Aircraft.** Arthur J. Hess. *Refrigerating Engineering*, v. 18, Sept. '44, pp. 192-195.

Types of aircraft heat exchangers. Fighting planes have complicated heat transfer problems.

23-262. **The Production of the Wickman 5-Spindle Automatic.** *Machinery* (London), v. 65, August 3, '44, pp. 113-120.

Factory layout; operations on castings.

23-263. **Results of Wartime Research on Babbitted Bearings.** T. E. Eagan. *Industry & Power*, v. 47, Sept. '44, pp. 76-78, 150, 152, 154.

Gravity cast and centrifugally cast bearings, proper methods of bonding, use of lead base bearings, a new two-bath cleaning process, bonding babbitt to cast iron, and effect of bearing thickness on bearing life.

23-264. **They Speak for Themselves.** Don H. Mitchell. *Die Casting*, v. 2, Sept. '44, pp. 20-22, 60.

Aluminum die casting the housing for radio set.

23-265. **Packaged Portable Power.** E. A. Jacobsen. *Die Casting*, v. 2, Sept. '44, pp. 23-25, 61.

In the design of small gasoline engines for large volume production, the use of die castings is a "perfect natural." Uniformity, thin sections, large fin areas, cast inserts, and minimum machining are the all-important points of advantage.

23-266. **Leakproof Bodies.** R. S. Taylor. *Die Casting*, v. 2, Sept. '44, pp. 26, 29.

Application of die castings to the Servel gas refrigerator; economy and efficiency of die casting.

23-267. **Packard Production of the Merlin Engine.** *Machinery* (London), v. 65, Aug. 17, '44, pp. 177-182.

The Packard Company assembles the Rolls-Royce Merlin engine on a continuously moving line which progresses around an oval-shaped track. Sub-assemblies move down straight assembly lines to the point where they are attached to the engine itself.

23-268. **"All Secure": Screws, Bolts, Nuts, Rivets Are Ready to Cut Costs.** *Modern Industry*, v. 8, Sept. 15, '44, pp. 42-46.

New fasteners have characteristics that every industry can put to work.

23-269. **Flush Pin Gages Meet Stiff Ordnance Requirements.** Wallace L. Kimball. *American Machinist*, v. 88, Sept. 28, '44, pp. 91-94.

Ordnance gage experts advocate adoption by industry of this gage, which is simple and inexpensive, and which is not damaged in storage or shipment.

23-270. **Trends in the Development of Aircraft Engines.** M. W. Bourdon. *Automotive Industries*, v. 91, Sept. 15, '44, pp. 24-25, 116, 118, 120.

Sir Roy Fedden foresees gradual decline of reciprocating engine in favor of gas turbine for airplanes.

23-271. **Pistons of American, British, French and Russian Aircraft Engines.** *Automotive Industries*, v. 91, Sept. 15, '44, pp. 28-32, 34, 72, 74.

Analysis and comparative data presenting the results of an exhaustive study made in Germany.

23-272. **Aluminum Foil—Its Production, Properties and Applications.** *Light Metal Age*, v. 2, Sept. '44, pp. 16-19.

History, manufacture, properties, uses.

23-273. **Methods of Using Dowel-Pins in Precision Tool Design.** Eugene E. James. *Machinery*, v. 51, Sept. '44, pp. 186-188.

Tool-room doweling practice; designation of dowel-pins; applications of semi-blind and blind dowel-pins; number of dowel-pins required.

23-274. **Gyro Stabilizers.** *Steel*, v. 115, Sept. 25, '44, pp. 78-79, 120, 122, 124, 126, 128.

Permit accurate firing of guns while tanks are in motion; may provide "floating" rides in postwar high speed trains and automobiles as well as stabilize equipment parts.

23-275. **Improved Production Techniques Employed in Turning Out Opposed Piston Diesel Engines.** *Steel*, v. 115, Sept. 25, '44, pp. 82-84.

Important steps in manufacture of engine shown.

24. DESIGN

24-41. **Wooden Models Aid in Selection of Special Production Machines.** C. A. Salmonsen. *American Machinist*, v. 88, August 31, '44, p. 101.

Use of wooden models to test the operations being planned make possible marked improvements in machine design. Suggested changes can be incorporated in the model immediately.

24-42. **Design Rules—VII.** Herbert Chase. *Die Casting*, v. 2, Sept. '44, pp. 45-51.

Fillets should be used at all inside corners (often at outside corners). Attain simplest shapes, avoid unnecessary projections. Unless machining is to be done, dimensional limits should be as great as possible.

24-43. **Sheet-Metal Pattern Development.** W. Cookson. *Engineering*, v. 158, July 14, '44, pp. 37-39.

Geometrical pattern drafting, in which the specified shape and size of the job, as set out on a working drawing, can be translated into a surface development on the flat metal sheet. Mathematical development.

24-44. **Design for Arc Welding.** T. B. Jefferson. *Welding Engineer*, v. 29, Sept. '44, pp. 35-37.

Building; modern trend; appearance; a multi-piece design; tension base; support base and top; from war to peace; what designers must consider.

24-45. **Machine Welding in the Fabricating Shop.** John Lippart and S. H. Hemenway. *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 215-216, 220, 222.

Comparison of cast and fabricated design problems.

24-46. **Welded Structures vs. Meehanite Castings.** Edward J. Charlton. *Iron Age*, v. 154, Sept. 21, '44, pp. 74-77, 168, 170-173.

Design and physical characteristics of diesel engine frames and other "heavy" machinery made of welded steel plate, as compared with similar structures made of Meehanite castings.

24-47. **Yield Strength—Vital in Aluminum Design.** Hiram Brown. *Light Metal Age*, v. 2, Sept. '44, pp. 24-27.

Aluminum alloys have been unduly penalized and limited by design specifications which have been based upon ultimate tensile strength rather than upon tension yield strength. Shows why tension yield strength is the most reliable factor; shows specifically where yield strength can be put to work as a reliable indicator of proper chemical composition and heat treatment.

24-48. **Designing Tools to Meet Labor Shortage.** J. S. Haldeman. *Machinery*, v. 51, Sept. '44, pp. 147-157.

Tools and methods designed to counteract labor shortages.

25. MISCELLANEOUS

25-189. **Small Diesel-Electrics Adapted to Steel Mill Switching.** F. H. Craton. *Steel*, v. 115, August 28, '44, pp. 102, 104, 127-128, 131.

Heavy 2-axle locomotives up to 80 tons and equipped with two identical power units meet requirements found in most steel mill yards in moving materials. Choice of high or low-speed equipment depends on such factors as character of service, number of hours to be used annually, type of maintenance and number of locomotives operated in the plant.

25-190. **Production Control Keeps Work Flowing Through Ohio Tool Co. Plants.** Robert Dixon, *Steel*, v. 115, August 28, '44, pp. 110, 112, 131.

Routing, dispatching and scheduling prime factors of production control. Tools include blueprints (both for reference and plant work), order files, ledger and shipping, routing sheets, stock control records and files, bin tags and storage, tool control system, drawing number system, material identification system and department identification symbols.

25-191. **Practical Ideas.** *American Machinist*, v. 88, August 31, '44, pp. 105-110.

Special holder varies uses of indicator. Paint priming rolled aluminum sheets. Toolholder life doubled by redesigning. Hydro shrink block eliminates hand forming. Portable device for handling car wheels. Safety stop for use on multiple-spindle drill heads. Chuck jaw adapters.

25-192. **Torque Wrenches Aid in Precision Assembly of Tubing.** John Curlett. *American Machinist*, v. 88, August 31, '44, pp. 94-96.

Standard torque loads have been applied to threaded connections in Douglas airplanes and torque wrenches for tubing.

25-193. **The Action of Extreme Pressure Lubricants.** *Lubrication*, v. 30, August '44, pp. 73-80.

"Film-strength"; thick-film; and boundary lubrication; temperatures of contacting high spots; prevention of welding; composition of extreme pressure lubricants. 7 ref.

25-194. **Examination of Various Fuel and Header Tanks Taken from Captured Enemy Aircraft.** *Metallurgia*, v. 30, June, 44, pp. 77-85.

Parts examined represent various fuel and header tanks taken from a Messerschmitt 109, a Heinkel III, a Fiat Cr. 42, and a Focke-Wulf 190.

25-195. **The European Patent Situation in the Immediate Post-War Period.** S. T. Madeley. *Metallurgia*, v. 30, June '44, pp. 95-96.

Reconstruction period after the war will create many problems concerning patents. Discussion of some of the problems.

25-196. **Tolerances and Inaccuracies in Physics.** Charles G. Darwin. *Foundry Trade Journal*, v. 73, June 29, '44, pp. 169-174.

Importance of studying the principles of tolerances.

25-197. **Industrial Engineering in War Production.** C. P. Spangler. *Iron & Steel Engineer*, v. 21, August '44, pp. 74-75, 82.

Ultimate productive speed comes only from the combination of the best mechanical methods and the maximum cooperation of every worker.

25-198. **Accelerated Programs in Engineering Schools—Their Good and Bad Features.** J. L. Bray. *Mining & Metallurgy*, v. 25, Sept. '44, pp. 420-422.

Present method of operation likely to have marked effect on postwar engineering education.

A.S.M. Review of Current Metal Literature— *Continued*

25. MISCELLANEOUS (*Cont.*)

25-199. **Possibilities of the Master Tooling Dock.** Leland A. Bryant. *Modern Machine Shop*, v. 17, Sept. '44, pp. 188-190, 192, 194, 196, 198, 200, 205, 206.
Considerations in designing fixtures for the master tooling dock.

25-200. **Color Code Identifies Correct Lubricant for Each Bearing.** Roger M. Baker. *Power*, v. 88, Sept. '44, pp. 79-81, 208.
Practical experience develops a color system that insures lubrication of each bearing with correct oil or grease.

25-201. **Heat Resisting Resins Have Wide Applications.** *Iron Age*, v. 154, Sept. 7, '44, pp. 81, 160.
Commercial production of Silicones make available to industry a class of fluids, greases and resins having unique stability against heat and chemical attack.

25-202. **Bar Bucking Assemblies Speed Riveting.** *Iron Age*, v. 154, Sept. 7, '44, pp. 82-83.
A "floating" bar, which can be positioned against the shank of a rivet, and two or more spring actuated hammers which react against the back side of the bar in opposition to impulses from a conventional air rivet gun.

25-203. **Jet Propulsion—The Principles and the Metallurgy Involved.** *Metal Progress*, v. 46, Sept. '44, pp. 497-504, 512, 516.
Jet propulsion of steamships; aircraft applications in general; gas turbines for power generation; high temperature essential; jet-propelled aircraft; the robot bomber; rocket projectiles.

25-204. **Insuring Effectiveness in Engineering Training.** R. L. Maw. *Mechanical Engineering*, v. 66, Sept. '44, pp. 588-589, 612.
Instructor selection; participation of management; student selection; courses should demonstrate applications of principles.

25-205. **What About Standards in Postwar?** *Tool Engineer*, v. 14, Sept. '44, p. 99.
They educate, simplify, conserve and certify quality. Development of standards; trend of standardization.

25-206. **Extreme Pressure Lubricants.** J. J. Mikita. *Steel*, v. 115, Sept. 11, '44, pp. 102-104, 148, 150, 152, 154.
Industrial applications. Data on lubrication of gearing and machine parts involving steel-to-steel contacts under heavy pressure. 7 ref.

25-207. **Tool Shank Standards.** O. W. Boston. *Steel*, v. 115, Sept. 11, '44, pp. 115, 168.
Preferred sizes.

25-208. **The Engineering Profession Tomorrow.** Robert E. Doherty. *Mechanical Engineering*, v. 66, Sept. '44, pp. 602-604.
War lessons for engineers. What constitutes the engineering profession? Non-professional activities of engineers; planning the educational program for engineers; cultivating intellectual power.

25-209. **New Riveting Assembly.** Thomas A. Dickinson. *Tool Engineer*, v. 14, Sept. '44, pp. 74-76.
Rivet-bucking assemblies developed for aircraft-production improve workmanship and reduce worker fatigue. Tpyes have been designed for application to automatic and manual riveting operations.

25-210. **Extending Life of Industrial Truck Tires.** C. B. Cook. *Iron Age*, v. 154, Sept. 14, '44, pp. 61-62.
Machine tool builder finds that turning or grinding down the lumps and removing the flat spots actually adds about 4 months to the normal life of industrial truck tires, thus not only conserving vital rubber but adding to the life of the truck.

25-211. **Non-Ferrous Alloy Specifications.** *Iron Age*, v. 154, Sept. 14, '44, pp. 66-98.
American Society for Testing Materials Specifications giving specification number, approximate alloy composition, condition, form and special requirements. Aeronautical Material Specifications giving number, approximate alloy composition, condition, form, and similarity to other specifications. U. S. Army Specifications giving specification number, approximate composition, form, and similarity to other specifications. U. S. Air Corps Specifications giving specification number, approximate alloy composition, form and similarity to other specifications. Army-Navy Aeronautical Specifications giving specification number, approximate composition, form, similarity to other specifications. U. S. Navy Specifications giving specification number, approximate composition, form, and similarity to other specifications. Federal Specifications giving specification number, approximate composition, form, and similarity to other specifications. S.A.E. Specifications giving specification number, approximate alloy, form, and similarity to other specifications.

25-212. **Rivet Control and Conservation in Aircraft Production.** H. Watkins. *Machine Tool Blue Book*, v. 40, Sept. '44, pp. 139-140, 142, 144, 146, 148, 150, 152, 154, 156, 158, 160, 162.
Convair's rivet delivery system.

26. STATISTICS

26-82. **Minerals in War and Peace.** C. K. Leith. American Society for Testing Materials *Bulletin*, no. 129, August '44, pp. 18-20.
Minerals as vital raw materials for industry and for armament and as controversial international problems.

26-83. **Magnesium Destined to Play Important Role in Post-War Economy—New Outlets Envisioned.** *Metals*, v. 15, August '44, pp. 10-13, 26.
Aluminum Co. of America, through its subsidiary, American Magnesium Corp., outlines uses to which metal may be put.

26-84. **The War's Impact on the Mineral Industry of Washington.** Milnor Roberts. *Mining & Metallurgy*, v. 25, Sept. '44, pp. 411-414.
Production increased in 1942 but dropped last year because of man-power shortages.

26-85. **What for Copper After the War?** W. R. Ingalls. *Mining and Metallurgy*, v. 25, Sept. '44, pp. 427-429.
Examination of proportions of old and new copper; post-war domestic demand; present known stocks.

26-86. **Where Is Aluminum in Post-War Era?** Walter Janssen. *Domestic Commerce*, v. 32, August '44, pp. 5-6, 24.
Principal uses by industry in the past and a postwar forecast. 900,000,000 lb. is best estimate of over-all tonnage for post-war demands. This is a little more than one-third of wartime capacity and a little less than three times peak peacetime production in 1939.

26-87. **Western Steel, A Riddle of Uncertainties.** *Iron Age*, v. 154, Sept. 7, '44, pp. 60-66.
Geneva plant has now become a symbol of the post-war threat of DPC plants to those which have been built and nurtured by private industry. Being a high cost producer, it can maintain its competitive position only by some form of government subsidy. Appraises Geneva's potentialities.

26-88. **British Iron and Steel.** *Metallurgia*, v. 30, July '44, pp. 135-138, 164.
Fuel, transport, and ore are likely to show much higher costs in the future. Much experimental work is necessary to make the best possible use of the lean ores available in this country, and plant and equipment must be modernized or arrears of repairs and maintenance made up as quickly as possible in the post-war period to facilitate economic production.

26-89. **Research and the Future of the British Iron and Steel Industry.** D. A. Oliver. *Metallurgia*, v. 30, July '44, pp. 139-142.
Research is the systematic exploration of the unknown. Systematic exploration avoids confusion, reduces the possibility of premature conclusions, indicates the often unexpected influence of one factor upon another, and results in the final application of a discovery or a development for the greatest benefit of mankind. It is this research which is the essential basis of industrial progress and which is discussed by the author in its application to the future of the iron and steel industry.

26-90. **Some Aspects which Affect the Future of the British Iron and Steel Industry.** J. Ross. *Metallurgia*, v. 30, July '44, pp. 143-144, 158.
Almost every industry is dependent upon ready supplies of iron and steel in suitable forms and at economic prices. To insure an adequate output, it is essential that British should have a well-organized and highly efficient iron and steel industry; to achieve this involves many problems, but steady and persistent work and the proper appreciation of the responsibilities shared by both work-people and managements should enable the industry to meet the needs of the finishing trades, not only for the home market, but to regain and expand vital export trade.

26-91. **Labour and the Future of the Iron and Steel Industry.** John Brown. *Metallurgia*, v. 30, July '44, pp. 145-148.
To achieve success in the development of the iron and steel industry cooperation between workpeople and management is essential. Views of the workpeople.

26-92. **The Nature of Postwar Competition of Western Steel Mills.** J. R. Mahoney. *Western Metals*, v. 2, Sept. '44, pp. 7-8.
Wartime steel requirements; excess capacities; alloy steel; progress toward maturity; postwar adaptations; raw materials basis for development.

26-93. **Lead Production, Imports, Consumption and Stocks.** *Mines Magazine*, v. 34, August '44, pp. 382-385.
Lead stocks; lead imports; domestic primary smelter and refinery output; domestic secondary lead; consumption of lead; premium price plan; production loss through military service.

26-94. **Developments in Arizona Metal Deposits.** Eldred D. Wilson. *Mining Journal*, v. 28, Sept. 15, '44, pp. 7-9.
Recent developments in Arizona's mineral industry contrasted with those existing during World War I, and a series of graphs illustrates the progress made by the industry over a 33-year period. Copper still leads all metals in the state in the value of its production, with gold ranking second.

26-95. **The Western Steel Industry.** J. R. Mahoney. *Iron Age*, v. 154, Sept. 21, '44, pp. 67-73, 166, 168.
Evaluates such economic factors as costs, plant efficiency, price and possible markets. Most logical field for the new western plants is that of exports to China, the Philippine Islands and the Netherland Indies. Revitalization of the Far East would act as a checkmate against the future strength of Japan.

26-96. **Economic Problems of Western Steel Industry.** *Steel*, v. 115, Sept. 25, '44, pp. 100-102, 124, 126, 128.
Conditions which will come to the west in post-war period. Characteristics of industrial pattern will depend upon various complex economic phases. Raw materials, markets and equipment studied as a basis for judgment of future course of western steel industry so greatly expanded during the war.

27. NEW BOOKS

27-117. **Industrial Research Service's Conversion Factors and Tables.** O. T. Zimmerman and Irvin Lavine. 262 pp., illus., Industrial Research Service, Dover, N. H. $2.75.
Features a 200-page table of conversion factors for the changing of scientific and commercial units from one system of measurement to another. This table is arranged alphabetically by name of unit, and gives the multipliers for about 6500 conversions, ranging from familiar ones such as inches to centimeters to unfamiliar ones such as Maxwells to Webers.

27-118. **Thermodynamic Charts.** Frank O. Ellenwood and Charles O. Mackey. 2nd ed., 46 pp., John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $2.75.
"Vapor Charts", including new charts for steam and water mixtures; tables of jet velocities for the turbine designer; psychrometric charts for the air conditioner; charts of properties of ammonia and freon for the refrigerator.

27-119. **Centrifugal Pumps and Blowers.** Austin H. Church. 307 pp., illus., John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $4.50.
Time-tested materials and methods plus basic information needed to understand and apply new theories. Contains sufficient information to completely design a pump and blower.

27-120. **The System of Mineralogy.** James Dwight Dana and Edward Salisbury Dana. 7th ed., v. 1, Elements, Sulfides, Sulfosalts, Oxides. 847 pp., illus. (37 pp. bibl. and bibl. footnotes). John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. $10.00.
Originally published in 1844, this volume has been entirely rewritten and greatly enlarged by Charles Palache, Harry Berman and Clifford Frondel. It is planned to publish the remaining two volumes as soon after the war as possible.

27-121. **Practical Design for Arc Welding; v. 1.** Robert E. Kinkead. Hobart Brothers, Hobart Square, Troy, Ohio. $3.50.
A series of designs for arc welding illustrated with plates and graph paper for each plate. Symbols, joints and sections for welding are also listed.

27-122. **Turret Lathes.** Emanuele Stieri. 211 pp., illus., Duell, Sloan & Pearce, New York. $1.50.
Descriptions of the various types of turret lathes and an explanation, in simple language, of their operation.

27-123. **Drill Presses.** Emanuele Stieri. 216 pp., illus., Duell, Sloan & Pearce, New York. $1.50.
An explanation of the design and operation of drill presses, specific jobs of drilling and practical details of the process in modern plants, with many tables.

27-124. **The Engine Lathe.** Emanuele Stieri. 308 pp., illus. Duell, Sloan & Pearce, New York. $1.50.
Drawings and descriptions of the operations of an engine lathe.

27-125. **Werkstoffkunde der Hochvakuumtechnik.** W. Espe and M. Knoll. 386 pp., illus., bibl. J. W. Edwards, Ann Arbor, Mich. $15.75.

27-126. **Technologie der Zinklegierungen.** Arthur Burkhardt. 2nd ed., 324 pp., illus., bibl. J. W. Edwards, Ann Arbor, Mich. $10.65.

27-127. **Analysis of Drill Jig Design.** J. I. Karash. 325 pp., illus. McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. $3.00.
An analytical, factual, systematic approach to the problems of tool design, using drill jigs as a specific case study and outlining fundamental principles and methods that apply in varied degree to all tool design problems.

27-128. **Electronics: Today and Tomorrow.** John Mills. 178 pp. D. Van Nostrand & Co., New York. $2.25.

27-129. **Theoretical Chemistry.** Samuel Glasstone. 515 pp., illus. D. Van Nostrand Co., New York. $5.00.

27-130. **Aircraft Sheet Metal Blueprint Reading.** Harry H. Coxen and others. 132 pp., illus., paper, spiral binding. American Technical Society. $2.50.
A series of questions and answers based upon separate folding blueprints making blueprint reading understandable and easy to follow. The first section of the book explains blueprint reading technique.

27-131. **A Shorter History of Science.** Sir William Cecil Dampier. 199 pp., illus. Macmillan, New York. $2.00.
The story of the advances made in all the physical sciences during each age, beginning with Greece and continuing to the present day.

27-132. **Plating and Finishing Guidebook.** 1944 edition. Metal Industry Publishing Co., 11 W. 42nd St., New York. $1.00.

27-133. **Direct-Current Circuits.** Earle M. Morecock. 405 pp., illus. (Rochester Technical Series.) Harper Brothers, New York. $3.25.
This textbook in electricity has been written in order to develop teaching materials which are functional and closely related to the requirements of industry.

27-134. **Laying out for Boiler Makers and Plate Fabricators;** Revised by George M. Davies. 5th ed., 526 pp., illus. Simmons-Boardman, New York. $7.00.
Chapters on the locomotive boiler have been expanded, and two new chapters on laying out and computing boiler patches and on laying out for welded construction have been added.

27-135. **The Engineer in the Post-War World.** 88 pp., paper, Research Bureau for Post-War Economics, 90 Morningside Dr., New York 27, N. Y. $2.00.
Speeches and addresses delivered at the Public Conference held in New York on March 4, 1944.

27-136. **Ultra-High Frequency Radio Engineering.** W. L. Emery. 305 pp., illus. Macmillan, New York. $3.25.
Developed from a series of lectures to the Electronic Teachers' Conference which was held at M.I.T. in the fall of 1941, this is a textbook for senior electrical engineering students.

27-137. **Die Wechselfestigkeit metallischer Werkstoffe; ihre Bestimmung und Anwendung.** Wilfried Harold. 276 pp., illus. J. W. Edwards, Ann Arbor, Mich. $7.25.

27-138. **Elektrische Messgerate und Messeinrichtungen.** Albert Palm. 231 pp., illus. J. W. Edwards, Ann Arbor, Mich. $5.50.

27-139. **Geogossene Metalle und Legierungen; Grundlagen der Metallgiessereitechnischen Werkstoffkunde.** Willi Claus and A. H. F. Goederitz. 345 pp., illus. J. W. Edwards, Ann Arbor, Mich. $13.50.

27-140. **Grundlagen der Photochemie.** Karl Fredrich Bonhöffer and P. Harteck. 295 pp., illus. (Chemische Reaktion, v. 1.) J. W. Edwards, Ann Arbor, Mich. $6.75.

27-141. **Grundlagen der Metallkunde.** George Masing. 127 pp., illus. J. W. Edwards, Ann Arbor, Mich. $3.85.

27-142. **Handbuch der Spritzgusstechnik der Metallegierungen einschliesslich des Warmpressgussverfahrens.** Leopold Frommer. 686 pp., illus. J. W. Edwards, Ann Arbor, Mich. $16.50.

27-143. **Hochspannungs-Praktikum.** Erwin Marx. 238 pp., illus. J. W. Edwards, Ann Arbor, Mich. $6.00.

27-144. **Passung und Gestaltung (ISA-Passungen).** Paul Leinweber. 240 pp., illus. J. W. Edwards, Ann Arbor, Mich. $5.00.

27-145. **Warmetechnische Rechnungen fur Industrieöfen.** Werner Heiligenstadt. 2nd ed., 340 pp., J. W. Edwards, Ann Arbor, Mich. $6.75.

MANUFACTURERS' CATALOGS IN REVIEW

Profilometer

Physicists Research Co., Dept. 14, Ann Arbor, Mich.

The technical aspects of the Profilometer as an electronic measuring instrument are discussed in a new "Technical Supplement" to the company's "Profilometer Comments." New 12-page booklet is a complete revision and enlargement of the former bulletin on this subject. Although devoted mainly to the development and technical side of the Profilometer, a section describes the entire line of equipment.

Mention R575 When Writing or Using Reader Service.

Induction Heat Treating

Central Boiler and Mfg. Co.,
5818 Rivard St., Detroit 11, Mich.

A new job shop service specializing in electronic induction heat treating is the subject of a 6-page, well-illustrated folder just issued. Folder cites advantages of induction heat treating and points out that the company's electronic induction heat treating department is available to industry as a new job shop service.

Mention R576 When Writing or Using Reader Service.

Shot Peening and the Fatigue of Metals

American Foundry Equipment Co., Mishawaka, Ind.

This 24-page booklet by H. F. Moore, research professor of engineering materials, emeritus, University of Illinois, is based upon many months of research and testing. The booklet is a comprehensive presentation of shot peening written under the sponsorship of this company; it contains many charts and tables and a glossary of technical terms.

Mention R577 When Writing or Using Reader Service.

Lithium Atmosphere Furnaces

The Lithium Co., 111 Sylvan Ave., Newark, 4, N. J.

Principles and data of the Lithium metallic vapor atmosphere furnaces are presented in this illustrated 20-page booklet. Discussing the atmosphere furnaces in general, the book then deals with the details and advantages offered by this equipment.

Mention R578 When Writing or Using Reader Service.

Electric Arc Stud Welder

Nelson Specialty Welding Equipment Corp.,
San Leandro, Calif.

The Nelson Electric Arc Stud Welding Process was developed to supply the need of industry for a dependable, portable means to end-weld metal studs to metal surfaces, this 18-page booklet says in describing the equipment offered by this company. Complete fusion of the stud to the plate is obtained by accurate control of the arc timing, automatic action of the welding gun, the use of a special flux-filled stud and complete shielding of the arc by the use of a porcelain ferrule.

Mention R579 When Writing or Using Reader Service.

Crucible Melters' Handbook

Crucible Manufacturers Association,
90 West St., New York 6, N. Y.

A handbook on crucible melting has just been issued by this association. Illustrated throughout its 16 pages and cover, the book is a treatise on crucible furnaces, and the storing, handling and use of crucibles. Printed in pocket-size, and written to help the foundryman get the best results from his crucible furnaces, the book will be a practical refresher for the long experienced man and a valuable aid to those newer in the work.

Mention R580 When Writing or Using Reader Service.

Screw Thread System

Aircraft Screw Products Co., Inc.,
47-23 35th St., Long Island City, N. Y.

This 16-page booklet gives engineering standards and technical information on "Aero-Thread" screw thread system. It provides data on standard sizes, basic formulas, and engineering information required for the application of this thread system. Dimensions and tolerances of standard screw connections are listed, together with description of typical applications for this screw system.

Mention R581 When Writing or Using Reader Service.

Plastic Metallic Packing

Plasco Packing Co., P. O. Box 600, Plattsburg, N. Y.

This plastic packing is composed of 95% metal alloy into which a specially prepared lubricant is introduced. Described in a 4-page leaflet, it is said to be specially adaptable for pumps handling petroleum products, and to furnace operators who use oil.

Mention R582 When Writing or Using Reader Service.

Mo-Max Steels

Cleveland Twist Drill Co., Cleveland, Ohio

This is a comprehensive discussion of the molybdenum-tungsten high speed steels marketed under the general trade name, "Mo-Max." Written by J. V. Emmons, metallurgist for this company, the 52-page book says that Mo-Max has revolutionized the tool steel industry by first introducing a successful molybdenum high speed steel. It has ten years of success back of it, and is thoroughly established with tried, tested and proven performance. The book discusses its quality for cutting tools, its machinability and heat treatment. Various applications are discussed.

Mention R583 When Writing or Using Reader Service.

Pneumatic Comparator Gage

Moore Products Co.,
H & Lycoming Sts., Philadelphia 24, Pa.

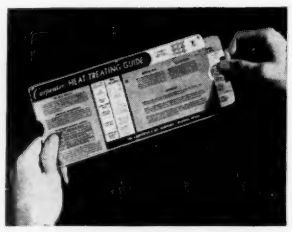
The advantages of the Moore Pneumatic Comparator Gage are shown in this 8-page leaflet describing installation, operation and maintenance. The human element of "feel" is completely removed with this instrument, with unskilled operators inspecting large production quantities to tolerances as small as 0.0001 in. Dirt, oil and grease on the work have no effect on the accuracy of gaging since the high pressure air automatically cleans the surface being gaged.

Mention R584 When Writing or Using Reader Service.

Heat Treating Guide

Carpenter Steel Co., 333 W. Bern St., Reading, Pa.

A new heat treating guide which should prove a great convenience and time saver gives complete information on the heat treatment of all Carpenter tool steels in handy, easy-to-use form. At a glance, the heat treater can find the following information for each steel: type analysis, forging heat, normalizing heat, annealing treatment, hardening treatment, furnace atmosphere and drawing range.



Mention R585 When Writing or Using Reader Service.

Carbon Meter

E. Leitz, Inc., 730 Fifth Ave., New York 19, N. Y.

This carbon meter is an electrical apparatus for quickly determining the carbon content, at the furnace, of samples chill cast from molten steel. The specimen is placed in the carbon meter and the instrument is so adjusted that the magnetic flux created in the specimen is equal to that created in a standard sample permanently installed in the instrument. A reading is taken from a slide wire and referred to a curve from which the carbon content is read. The leaflet pictures and gives further details on this instrument.

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Evaluating the Forgeability of Steels

Steel and Tube Div., Timken Roller Bearing Co.,
Canton 6, Ohio.

This 72-page book, prepared by C. L. Clark, research metallurgical engineer at Timken, presents data obtained from the hot twist test as a guide in determining the optimum conditions for hot forming operations. The apparatus and procedures used in this test are described and the results of tests on various steels are interpreted, including carbon, chromium, nickel, chromium-nickel, chromium-nickel-molybdenum, chromium-molybdenum, chromium-silicon-molybdenum, chromium-vanadium, nickel-molybdenum, N. E. steels, manganese-molybdenum, nitralloy, stainless austenitic, and tool and die steels.

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Melting and Carburizing Furnaces

W. S. Rockwell Co., 50 Church St., New York 7, N. Y.

Two 4-page bulletins, No. 411 and 412, describe crucible melting furnaces and rotary carburizing furnaces. Both are well illustrated with details of construction and use.

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Flat Spray Nozzles

Chain Belt Co., Milwaukee, Wis.

Bulletin 459, an 8-page leaflet, describes Rex flat spray nozzles for service where water is used in cleaning, cooling and washing operations. They are made in a variety of sizes and from a variety of materials. The folder, besides illustrating and describing the nozzle, gives tabular information concerning their discharge in gallons per minute; their dimension; a list of materials, sizes and prices.

Mention R589 When Writing or Using Reader Service.

Handiplater and Tank Linings

The Udylite Corp., 1651 E. Grand Blvd., Detroit, Mich.

The Handiplater, a sturdy, compact plating unit capable of doing an efficient processing job for odd lots of small parts, is described in this new bulletin.

Another Udylite bulletin describes Koroseal tank linings featuring application and advantages along with tabular material showing chemical resistance of the linings.

Mention R590 When Writing or Using Reader Service.

Metallurgical Service

F. A. Pease Laboratories,
11-13 Coes Place, Newark 2, N. J.

The scope of metallurgical service presented by this company is described, featuring radiographic examination with 250 and 100-k.v. X-ray units and fluoroscopic screen. Such examination provides a non-destructive test of metal parts, castings and welds for such defects as voids, inclusions, porosity, and segregation. Company is set up for either single radiographs or production testing of large numbers of pieces.

Mention R591 When Writing or Using Reader Service.

Hot Working Improves Properties of Metal

Drop Forging Association,
605 Hanna Bldg., Cleveland, Ohio.

How hot working improves quality of metal is described and illustrated in a 40-page booklet intended for users of forgings, instructors in engineering and metallurgy, designing engineers, metallurgists and production and management executives throughout the metalworking industry.

First dealing broadly with characteristics of forging materials, the booklet features steel, and in a not-too-technical language and also by means of more than 200 halftones and diagrams gives a clear understanding of how this metal gains in strength and toughness, step by step, progressively through hot working operations, from ingot to finished forging.

Mention R592 When Writing or Using Reader Service.

Process Equipment Catalog

H. K. Porter Co., Inc., Oliver Bldg., Pittsburgh 22, Pa.

Displaying an extensive line of process equipment, the first catalog illustrating the combined resources of this company and its divisions, J. P. Devine Mfg. Co. and Quimby Pump Co., has just been issued. Forty different categories of process items, ranging from the smallest agitator to huge process vessels, are listed, with many illustrations, engineering drawings and descriptions of operating principles. A number of recently developed products and improvements to standard lines are described.

Mention R593 When Writing or Using Reader Service.

The Metals REVIEW
THE MONTHLY SURVEY AND DIGEST OF WHAT'S NEW IN METALS

Index to Advertisers

	Page
Buehler, Ltd.	7
Continental Machines, Inc.	14
Electric Furnace Co.	10
Electro-Alloys Co.	11
Hevi Duty Electric Co.	11
Houghton & Co., E. F.	11
Lindberg Engineering Co.	5
MacDermid, Inc.	16
Martindale Electric Co.	16
Ryerson & Son, Inc., Jos. T.	5
Spencer Lens Co.	5
Toledo Scale Co.	7

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7
14
10
11
11
11
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16
16
5
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713